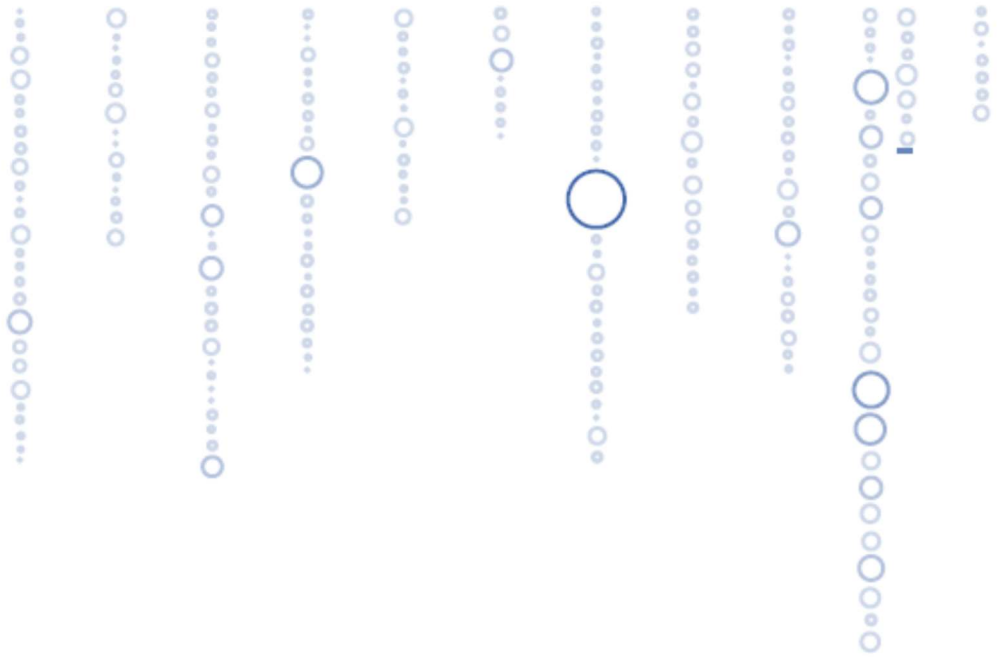
Data to the People:

Incorporating Data Visualization into Communications Content

Strategic Communications Capstone
University of Minnesota



Rebecca Morales
7-13-2017

Table of Contents

About the Author

Rebecca Morales is a member of Cohort 11 in the Professional MA in Strategic Communications at the University of Minnesota. She is an English major, a Data Analyst, and a passionate communicator, and is excited to bring her professional and academic worlds together in this paper. Rebecca is inspired by the beauty and creativity of exceptional data visualizations, and passionate about communicating, words and writing. Professionally, she strives to bring a strategic approach to every problem and to create visualizations that are instructive, relatable, and aesthetically stunning. She is eager to see what lies ahead for a creative data communicator with boundless curiosity.

Executive Summary

Data visualization is a powerful method of conveying complex information, and its popularity is rapidly growing beyond its traditional boundaries of statistics and computer science. However, data visualization is infrequently featured as a communications tool, and is rarely taught to communicators as a key element to consider in developing a communications plan. The purpose of this study is to bring together two fields with great potential for one another. This paper attempts to clarify and encourage the use of data visualization as a communications tool in order to drive the field of strategic communications forward.

In the literature review, I've included highlights of the history and science behind data visualization and listed a few examples in order to introduce communicators to the established foundations of data visualization. I've also used a few communications theories that align with methodologies for data visualization in order to highlight the theoretical overlap between the fields.

In light of the shortage of communications-specific material available, I've chosen to treat the history and state of the field of data journalism as a proxy in the literature review. Because of the close relationship and occasional overlap between communications and journalism, I've borrowed definitions and concepts from data journalism, and extrapolated lessons learned as a method of investigating the potential for visualizations in communications. I've also considered industry next steps and current best practices in an effort to place this paper in context.

In order to find more specific ways that data visualization can be incorporated into communications content, I've conducted expert interviews. I consider these experts to be at the forefront of the field, representing the potential for a growing trend. The interviews test hypotheses that attempt to provide a theoretical communications framework for data visualization, and seek answers to the questions "How are communicators using data visualization? What is the theoretical use case for data visualization? How can data

visualization play a bigger role in the communications process?" These questions are intended to help bridge the current gap between communications and data visualization literature.

These interviews provided some surprising and some anticipated reflections on the questions asked, and notable common themes across interviewees. I've condensed the findings into observations of areas where interviewees converge or diverge, some of which support or refute themes from the literature review. Finally, I've listed a few recommendations for communications-specific best practices that supplement the existing literature.

Introduction

This study makes a case for data visualization and explores the ways in which it can interact with a strategic communication process. It draws widely from literature on data visualization, data journalism, information design, and communications theory, including academic studies, business advice, best practice guides, and case studies from the field.

The following literature review is designed to introduce communicators to the power of data visualization by establishing definitions, briefly mentioning the science behind visualization, and offering a few exceptional examples. It addresses the state of the field of data journalism by reviewing case studies and emerging trends in an effort to suggest what the future interaction of data and communications could look like. Finally, it captures the next steps proposed in the literature and offers a brief review of the types of best practices and guides currently available.

Literature Review

The Power of Data Visualization

Although many articles seek to apply data visualization to a variety of fields, there is little available that specifically addresses data visualization from a strategic communications perspective. Studies of visual communication within communication journals are dominated by rhetorical studies, and rarely focused specifically on data. Those studies of visual communications are primarily rhetorical, semantic, or pragmatic (Hope, 2006).

Background: The use of graphics to display information is a broad category, defined, described, and categorized in many different ways by researchers. Visualization combines a few necessary components – data, specifications, and time – to create images that are perceived by the user resulting in an increase in knowledge (Van Wijk, 2005). Data visualization and information visualization (often shortened to Data Viz or Info Viz) are often interchangeable terms used to describe either a single example or the field as a whole (Young, Hermida, & Fulda, 2017). Products can be examples of "infographics," although that term is also used to describe simpler images which are not data-driven. Some differentiate data visualization from other types of visualization by the complexity of information conveyed (Segel & Heer, 2010), a valuable distinction for our purposes. The most common forms of data graphics are charts, maps, and diagrams. Examples can be static, interactive, or animated, and are often combined to reveal a larger narrative. The purposes of data visualizations can be explanatory, editorial, persuasive, or exploratory (Otten, Cheng, and Drewnowski, 2015).

The definition of data visualization as "a visual representation of information or knowledge" (Young, Hermida, & Fulda, 2017, p. 4) is simple and accurate, but leaves ample space for interpretation, and is broad enough to extend well beyond data visualization. Effective data visualization in the modern environment requires some combination of computer science, statistics, artistic design and storytelling (Segel & Heer, 2010), and is often acknowledged as a hybrid form. A case study of the state of narrative visualization

concludes that "a deeper understanding of narrative visualization is still elusive" (Segel & Heer, 2010, p. 1140) because most purveyors tend to excel at either narrative or visualization, and even those who do both well tend to define them loosely. Scholarship so far is dedicated to defining and differentiating between types. "But taken collectively, they have produced a cacophony of overlapping and indistinct definitions that forms a shaky foundation for deeper research into these practices" (Coddington, 2015, p. 332).

Leaders and influencers in the field of data visualization define it as "visual representation of evidence" and a means of ensuring that "clear and precise seeing becomes as one with clear and precise thinking (Tufte, 1997, p. 53)" It can be defined as a technology, considering that term loosely as a means to fulfill a purpose, aimed at helping an audience complete a certain task (Cairo, 2013). Edward Tufte, a preeminent thinker in the field of visualization, believes that "At their best, graphics are instruments for reasoning about quantitative information. Often the most effective way to describe, explore, and summarize a set of numbers…is to look at pictures of those numbers. Furthermore, of all the methods for analyzing and communicating statistical information, well-designed data graphics are usually the simplest and at the same time the most powerful (Tufte, 2001, p. 9)."

Alberto Cairo, a prominent data journalist and a leader in the field, sees data visualization as a component of information architecture, which he describes as the link from information to wisdom, helping readers avoid "the black hole between data and knowledge" (Cairo, 2013, p. 15). Data visualization can be seen as a type of information design, defined as "the art and science of integrating writing and design so that people can use content in ways that suit their personal goals" (Schriver, 2013).

Explanations: The reasons that data visualization is an effective method of conveying information have been well-documented. In an effort to retain information, our brains compartmentalize and store chunks of information for future use. Readers can retain more if designers help them compartmentalize more effectively. A good visual display should present meaningful patterns that are more easily remembered than separate data pieces. Stephen Few (2012) tells us that "This is one of the reasons that graphs are capable of

communicating a great deal of information that can be perceived all at once – we can…discern in a graph the image of a single, meaningful pattern that consists of thousands of values" (p. 67).

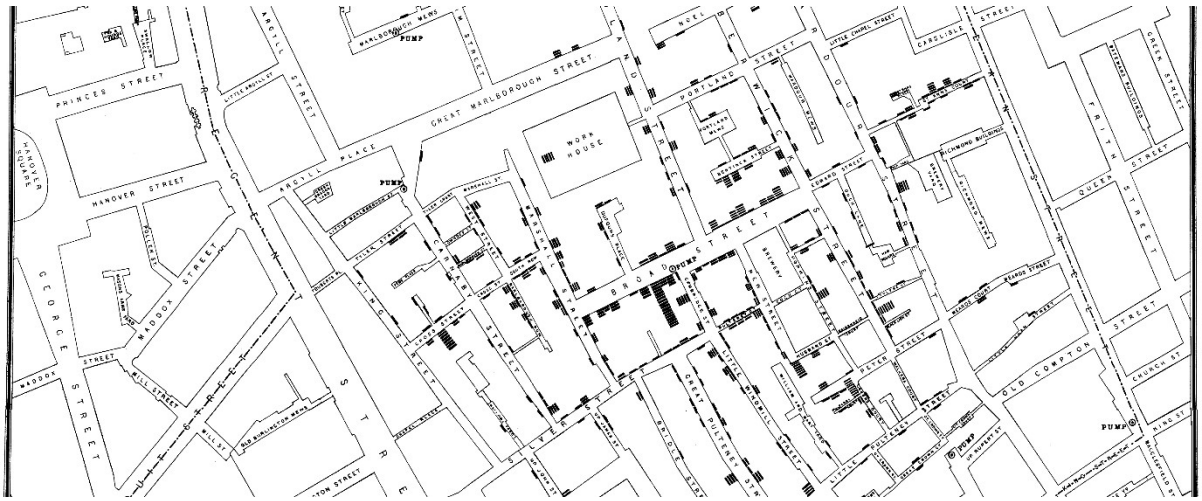
Studies of functional documents have shown the following: "1. Readers are selective about what and how they read. 2. They read to accomplish their own purposes. 3. They actively interpret documents in light of their own knowledge and expectations" (Hilligoss, 1999, p. 3). Preparing a more visually appealing product, especially one that can be interpreted quickly and easily, makes it more likely that it will be interpreted fully by the reader. Studies show that people typically remember content presented visually more easily than content presented in other ways, and generally find use of pictures more engaging than content without pictures (Schriver, 2013).

In their study of the user relationship to data visualization, Brehmer and Muzner (2013) found that users engage with data visualization in a variety of different ways. Their primary goals are to consume, present, discover, enjoy, produce, search, or query (Brehmer & Munzner, 2013). In terms of data visualization presented in communications content, consume, discover, and enjoy are likely the most relevant functions. Interactive visualizations also give users the opportunity to search and query the data. In Katz, Blumler, and Gurevitch's 1973 exploration of Uses and Gratifications of media use, they propose that users seek out various media based on an essential desire to socialize, be informed, identify with others, relieve stress, or be entertained. This provides a theoretical crossover between use of data visualization and use of more traditional communications forms. The "Informative" Uses and Gratifications functions mirror the "discover," "search," and "query" functions evident in Brehmer and Muzner. Perhaps surprisingly, the "Entertainment" Uses and Gratifications function is reflected in Brehmer and Muzner's observation that some users interact with data simply for enjoyment.

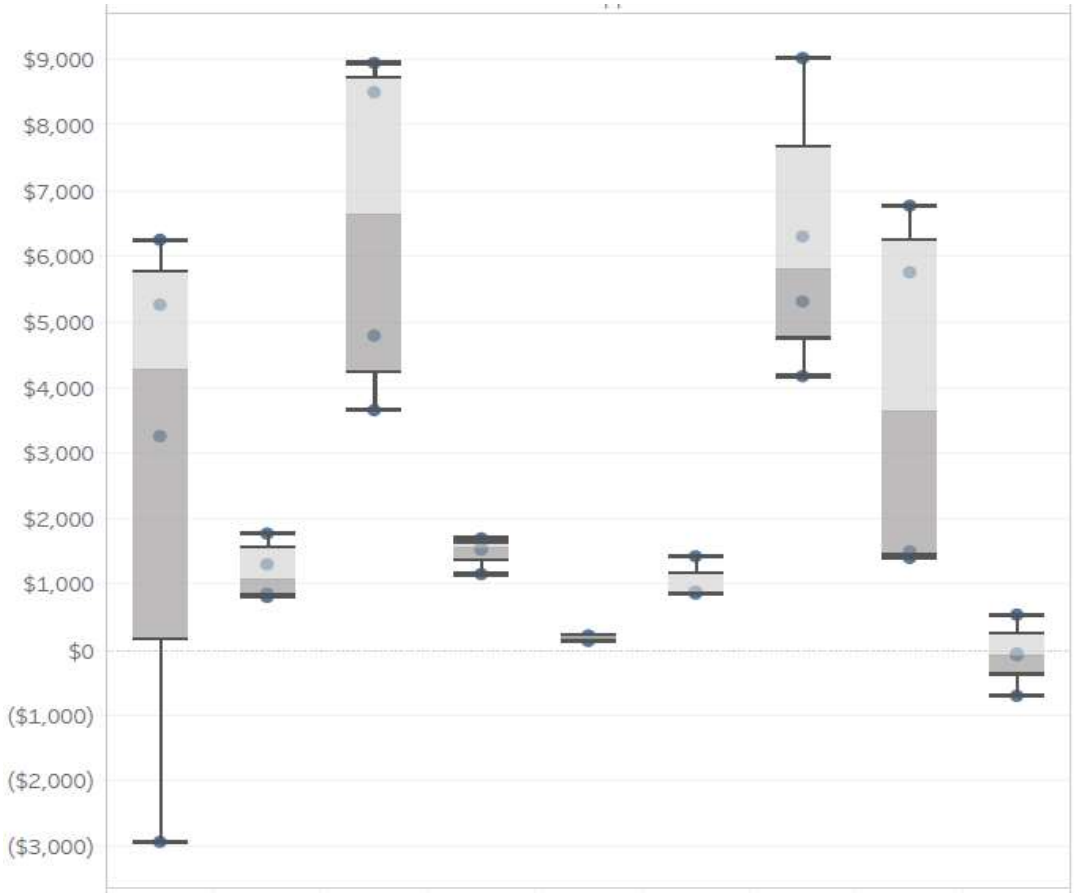
Data visualizations create easily recognizable patterns through the pre-attentive attributes of form, color, spatial position, and motion. These attributes are easily processed below the level of consciousness at a very high speed, enabling us to quickly draw conclusions. Used properly, these visual attributes create

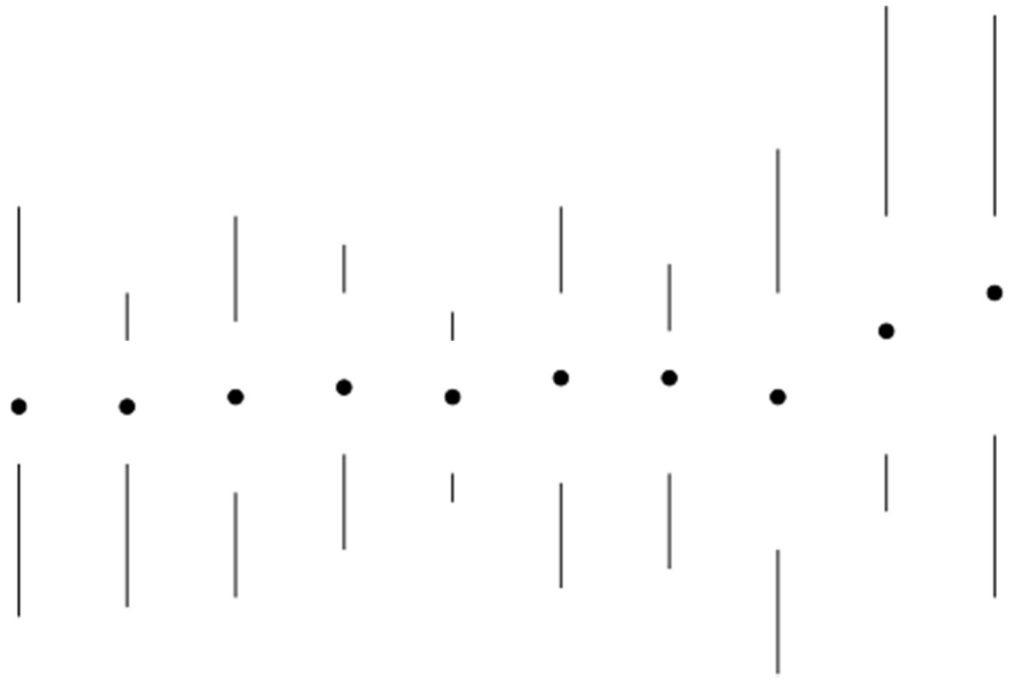
opportunities for data visualizations to emphasize important information, separate variables or elements, and create quickly learned stories about the relationships between different pieces of data (Few, 2012).

Examples: One of the most famous early triumphs of data visualization is the case of Doctor John Snow, who in 1854 plotted cases of cholera on a map and discovered that they were clustered near a few water sources. Cholera was previously believed to be an airborne disease, but Snow's map provided visual evidence that it was a water-borne illness. This single proof has permanently affected the medical community and saved countless lives (Tufte, 1997). Below is a section of Snow's simple but effective visualization.



In 1990, Edward Tufte introduced a style of aesthetically pleasing but functionally focused minimalism that has dramatically reshaped the tenets of data visualization. Tufte popularized the concept of "chartjunk" and introduced measurements for "data-ink ratio" (Tufte, multiple), and he became famous for stripping away unnecessary elements of visualizations. Cairo (2013, p. 63) names Tufte as "arguably the most influential theoretitian on information design and visualization, and deservedly so." Below is an example of Tufte's minimalist impact. The first chart is a standard box and whisker plot created by the author for this paper. Following is Tufte's proposed version of a minimalist box and whisker plot, stripped of chart-junk and non-data ink, from *The Visual Display of Quantitative Information* (p. 125).


$9,000
$8,000
$7,000
$6,000
$5,000
$4,000
$3,000
$2,000
$1,000
$0
($1,000)
($2,000)
($3,000)



Hans Rosling, a Swedish global health professor and physician and founder of the Gapminder foundation, has made demonstrating global trends in health and economics his life's work. In order to support Gapminder's mission of "building a fact-based world view that everyone understands," he partnered with a software designer in his family to create his own visualization software, which was eventually purchased by Google. Rosling excels at demonstrating surprising connections in readily available data by plotting populations as moving bubbles on a scatterplot that he narrates with inspiring clarity and enthusiasm. His 2006 TED talk fundamentally affected the industry, launching an intense and lasting interest in visualization as presentation or video (Cairo, 2013; Hans Rosling – TED Speaker).

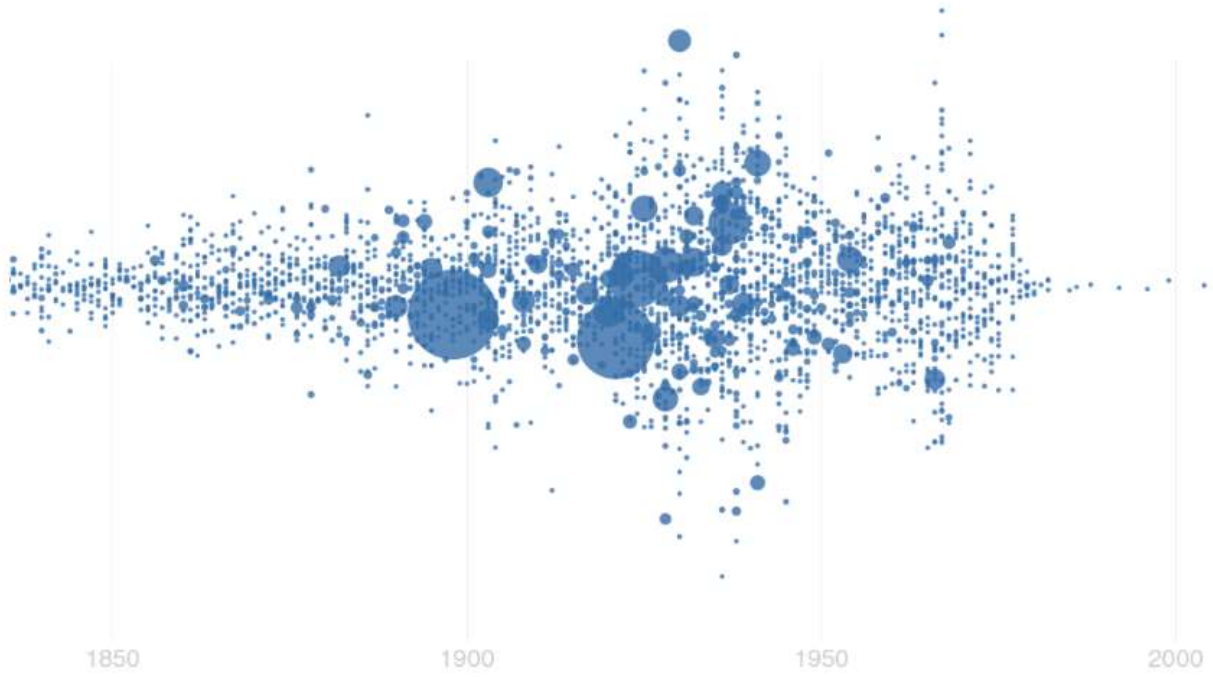
Current State

Technology: A rapidly growing influx of data has affected nearly every field, creating opportunities for new discoveries and necessitating methods of understanding and communicating data. Google's 2010 announcement that humans were producing every two days roughly the same amount of data produced between the beginning of time and 2003 changed the way we look at data, and data production has continued to increase exponentially (Cairo, 2013).

As Cairo (2013) and Knaflic (2015) point out, much of this data is free and easily available online. They also observe that free and easy to use software for manipulating and visualizing data is quickly becoming more common. In their case studies of Canadian award winners in data journalism, Hermida, Young, and Fulda (2017) suggest that many of the evident standards in the field are actually reflections of software availability. The availability of data and software have made working with data necessary, but they have also made it easier.

For example, the following visualization was created by Florian Kräutli as part of his personal research on interactive data visualization for cultural data. The data comes from the Tate collection, who published data on their artwork through GitHub, a data sharing platform equally popular with advanced

programmers and technical novices. The data was free and publicly available, and Kräutli used the information to create an interactive map of artists' contributions over time (Kräutli, 2013).



Data Journalism: The lack of a strong theoretical basis for considering data visualization necessitates a study of practical applications. I've turned to data journalism for examples of ways that data is being successfully integrated into a field that previously relied primarily on writing and photographs. The connection and occasional overlap between journalism and communications suggests a strong basis for comparison, and the rapid growth in frequency and popularity of data visualization within journalism provides a model for potential growth within strategic communications.

There is significant debate about the origins of data journalism, but it is likely to have developed from the social science based concept of "precision journalism," defined in 1973 as the ability to achieve more definitive answers through empirical methods. In the late 1980s and early 1990s, "computer-assisted reporting" emerged as a method of introducing large-scale data into investigative reporting, and it quickly gained popularity through a few large-scale, prize-winning publications (Coddington, 2014). Some describe

CAR as a predecessor to data journalism, some use the term interchangeably, and others see it as a coexisting field. Coddington (2014) suggests a typology separating CAR, data journalism, and computational journalism by professional orientation (professional vs. networked), openness (opaque vs. transparent), epistemology (samples vs. big data), and vision of the public (passive vs. active). While most of the other sources cited in this paper don't make the same distinctions, Coddington's view of data visualization as a transparent medium in which to engage an active audience with big data is representative of common definitions.

In the 1990s, data journalism and CAR began to increase in popularity, but professional standards were not yet established. New developments were frequent, but often led in different directions. In the early 2000s, developments in visualization began to appear incrementally, suggesting increased maturity of the field (Van Wijk, 2005). Since the late 2000s, data journalism has become a common buzzword, usually treated as a tool rather than the focus of a project (Young, Hermida, & Fulda, 2017; Coddington, 2014). Starting in 2012, award-makers for journalism began to recognize data as a category, suggesting "an emergent distinction being made within the professional categorization of the genre" (Young, Hermida, & Fulda, 2017, p. 2). In the last several years, data journalism has become increasingly prevalent within the field of journalism, and has reflected the digitization of other industries and society (Coddington 2014).

While there are many exceptional examples, The New York Times has become a decisive leader in the field. Cairo (2013) calls it "the standard for (data journalism)," and notes the publication's consistently high quality and impressive frequency. Editors in the graphics group credit the size of the department and the reporting abilities of the entire staff, including those in primarily technical roles (Cairo, 2013).

Currently, studies assessing the field of data journalism are easy to find. Most of these investigations are regional and based on case studies, suggesting that there is room for a wider-scale study. I've attempted to draw recurring elements from a few of these regional studies here. Most existing studies also develop unique typologies or rubrics, attempting to establish best practices for a relatively uncharted field.

Case studies summarized by Young, Hermida, and Fulda suggest that the most common examples of data visualizations in journalism featured combinations of multiple types of visualizations, often simple static

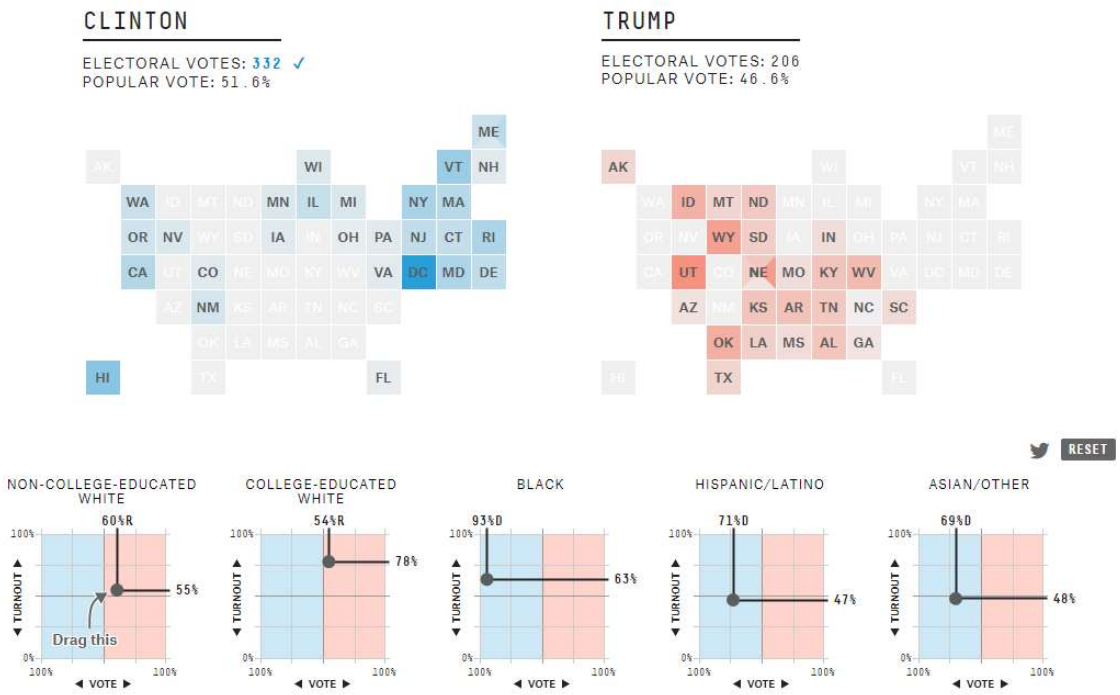
charts with maps or pictures. In their follow-up study of award winners in data journalism in Canada, they found evidence of an immature and still growing field. They found that most available examples came from large, well-funded newsrooms, were produced by one to two people (typically data specialists), and weren't sophisticated technically (Young, Hermida, & Fulda, 2017).

This not only suggests a field in its early stages, but also suggests a product influenced by the available technology, rather than the other way around. Young, Hermida, and Fulda (2017) suggest that current technological constraints can undermine the journalistic integrity of the stories being published, but they also acknowledge that the availability of open source data and software is enabling the journalistic value of transparency. They found that the current standards for data visualization are defined by availability of tools in lieu of any formal guidelines, which suggests room for the field to develop through an increased focus on theory.

Trends: One of the largest emerging trends in data journalism and data visualization in general is interactivity and a focus on user engagement. This is partly because of a strong focus on the public- data journalists draw information from public sources and present data on the public's behalf, allowing the public to perform their own analysis whenever possible (Coddington, 2014). Functionally, interactive visualizations are intended to invite verification, new questions, and alternative explanations (Segel & Heer, 2010). They are typically defined by the user's degree of agency over the content (Young, Hermida, & Fulda, 2017).

Below is an example of an interactive data-driven graphic created found on fivethirtyeight.com. FiveThirtyEight is the product of Nate Silver, a statistician famous for his accurate predictions of political races. His site, now owned by ESPN, features journalistic articles, graphics, and predictive analytics on subjects that range from politics to culture to sports. The following graphic is one of many 2016 presidential election predictors featured on the site, and gives the reader the ability to change predicted election results within a pre-created probability model. As the user drags a dot's location, altering voter turnout and voting results by demographic, the results are updated according to FiveThirtyEight's predictive statistical model.

This answers the questions "Who is most likely to win the election based on expected voter turnout?" and "How much does the vote of a particular demographic impact the overall results?" while creating an opportunity for the user to interact with the data and share his or her own predictions on Twitter (Bycoffe and Wasserman, 2016).



Transparency is also an important topic in data journalism, and creators of visualizations are expected to provide raw data in order to give their readers an opportunity to verify the journalist's assumptions. This practice is a trust-building opportunity that is driving journalism to a more democratic standard (Coddington, 2014). Cairo also suggests that providing data increases reader trust, as evidenced by his own attempts to recreate other journalists' visualizations. He uses the data they provide to validate their hypotheses, suggesting that his desire to see, read, explore, and analyze other writers' data is the basis through which he can trust them (Cairo, 2013).

Interactivity is generally assumed to increase user engagement, and studies suggest that a sense of control positively impacts the user's reaction to information (Young, Hermida, & Fulda, 2017). A reader-driven approach is generally assumed to work best when the goal is to engage the reader by allowing him or her to explore the data, discover patterns, and form his or her own hypothesis (Segel & Heer, 2010). Readers are viewed as "co-constructors of truths and moral claims" (Coddington, 2014, p. 335). Readers have been found to enjoy feeding tools with their own questions and information, and they have shown improved information recall with greater levels of interactivity (Young, Hermida, & Fulda, 2017).

This overlaps neatly with communications theories of engagement. Content, when treated as a method of engaging readers, can be thought of as a conversation. Answering a reader's questions in published content and encouraging further interaction are common strategies for creating successful content. This is the premise behind good social media content- creating opportunities for users to interact and engage (Redish, 2007).

The Elaboration Likelihood Model also provides a communications-relevant theoretical basis for the proposal that users will engage more fully in data visualizations than in other communications content. According to Petty and Cacioppo's 1986 article proposing the Elaboration Likelihood Model, receivers process communications either peripherally – shallowly, relying on heuristics and inferred information – or centrally – deeply, and with applied reasoning. Some receivers are more likely than others to engage in central processing – those with a "need for cognition." These users simply enjoy processing information, and are likely the users who seek out and attempt to engage with data visualizations. The other factor likely to inspire central processing is personal motivation, and it is possible that well-used data visualization can create stronger personal motivation. As mentioned above, interactivity gives the user agency over the visualization and possibly increases engagement. The ability for users to enter their own information into a visualization or manipulate a visualization for their own purposes could increase personal motivation. When attempting to convey complex information, it is possible that data visualization could inspire the central processing that the Elaboration Likelihood Model suggests will result in a deeper understanding of the subject matter.

However, many existing examples of interactivity don't necessarily complement the stories they are meant to support. Some overwhelm users with too much information, and some fail to establish any particular narrative (Young, Hermida, & Fulda, 2017). Through their case studies, Segel and Heer (2010) found that annotating stories with data (rather than letting readers find their own stories in the data) improved usability and provided more opportunities for readers to become invested in the data.

Next Steps and Best Practices

Interdisciplinary Potential: Most researchers studying data journalism or data visualization suggest that the field could continue to mature through an interdisciplinary approach. Case studies found that utilization of narrative messaging techniques "such as repetition of key points, introductory texts, and final summaries and syntheses" improved the few examples that focused on these elements (Segel and Heer, 2015, 1145). Some call specifically for a multidisciplinary approach, suggesting that development "beyond established industry-specific norms, practices, and professional mythologies" would enrich a currently limited field (Young, Hermida, and Fulda, 2017, p. 14). Data visualization is "based on principles from the fields of psychology, usability, graphic design, and statistics with the aim of reducing barriers (limited time, information overload) to understanding important information" (Otten, Cheng, and Drewnowski, 2015, p. 1901). The cross-expertise required for the creation of quality data visualizations is currently in short supply, and that there is more work to be done in bringing data into visual communication design and vice versa (Otten, Cheng, and Drewnowski, 2015).

The desire for interdisciplinary growth and the focus on user engagement in existing data visualization literature provide a clear opportunity for growth within strategic communications. In an effort to grow within the existing field of journalism rather than create a new arena, data journalists describe their work as focused on narrative, storytelling, and traditional reporting. They strive for recognition from professional journalists, and link their work directly to existing norms within journalism (Coddington, 2014). This offers a

model for incorporating data visualization into existing communications structures by emphasizing its usefulness as a tool that supports existing models and theories.

In order to incorporate data visualization in communications models, it may be helpful to propose a specific task or place in a communications model where data makes obvious sense. The Campaign Drivers proposed in *The Successful Marketing Plan* provide a theoretical framework for dividing communications tasks into a few comprehensive groups. These Drivers represent the seven possible goals for advertising, theoretically dividing all communications tasks into the following buckets: Awareness, Emotional Bond, News, Activation, Loyalty, Experience and Buzz (Hiebing, Cooper, & Wehrenberg, 2012).

These Drivers also provides a framework for describing the ways in which data visualization can contribute to a campaign. News, one of the six Drivers, is a communications task with an obvious relevance to data, and which directly reflects the success of data journalism. The News Driver describes the need to show and tell, inviting the reader to engage intellectually. This is the essential function that data visualization fulfills. The news driver is described as an attempt to "own the mind share among the target audience consumers of one salient benefit and drive it home as the reason to buy. In this case, you need, what the research firm Hall & Partners, describes as 'a difference that makes a difference'" (Hiebing, Cooper, & Wehrenberg, 2012, p. 377). The transparency that interactive data visualization can provide empowers readers to learn and discover new information on their own terms.

Existing Best Practices: Existing best practices for data visualization typically lie on either end of a scale between overly general thought processes that apply to most fields, and deeply specific tips on choosing types of graphs of perfecting those types.

Some of the best of both come from the thought leaders in the field. Edward Tufte's books and classes all focus on large concepts, like graphical integrity, ease of readership, and beauty of design. Many are inspired by his work and learn to think of their data in new, simpler, more creative ways. He offers general advice and inspiration like the following: "visual representations of evidence should be governed by principles of reasoning about quantitative evidence. For information displays, design reasoning must correspond to

scientific reasoning. Clear and precise seeing becomes as one with clear and precise thinking" (Tufte, 1997, p. 53). As discussed above, he also provides a few examples of stripped-down graphics, recreating common chart types to help creators think of their data in new ways. *The Visual Display of Quantitative Information* is probably his most specific book, combining graphical practice and theory. However, as Cairo explains, "many readers of Tufte's work…feel a bit disoriented when they try to transfer his abstract principles to the real world" (Cairo, 2013, p. 65).

Alberto Cairo's 2013 book, *The Functional Art*, is also a widely-referenced guide to data visualization. He uses more current tools than Tufte and comes from a journalistic background. He attempts to bridge the gap between theoretical and hands-on by dividing his book into foundations, cognition, practice, and interviews with exemplars in the field. While his practical advice is more literal and more firmly grounded in design principles, he also speaks about general rules, and is guided by the principle that form should follow function. He describes his process as follows: "Start with a strong focus, do as much research as you can, organize, summarize, and then deliver your conclusions in a structured and visually appealing manner" (p. 154). These general rules make data visualization easier and more clearly directed, but they also apply to almost any type of academic study. While he does go on to make suggestions about color, form, and type, his greatest contributions are on the thought process behind using data to tell a story.

Interestingly, most best practices specifically mention striving for beauty in visualization. Leaders in the field disagree about what makes a visualization beautiful (divided by factors like information density and quality of design), but most strive for the common goal of beautiful data. One of Tufte's books is called *Beautiful Evidence*, and his design guidelines are all focused on creating beautiful visualizations. Cairo (2013) puts the attractiveness of visualizations on a wheel, showing the components that create more complex/deeper visualizations opposed from those that contribute to shallower, more intelligible visualizations. The contributing components are all elements of beauty, but they emphasize different components to fulfill different goals.

Stephen Few (2012) is a self-proclaimed data prophet whose mission is to "help people present qualitative information in the most informative way possible" (xv). In an effort to improve the presentation of data, he walks business people through the cognitive functions involved in processing data, the capabilities of the human eye in perceiving data, and the foundational design concepts that can improve daily charts and graphs. His work is the antidote to the flashy but difficult-to-read graphs that easily created though Excel or PowerPoint.

Cole Nussbaumer Knaflic's 2015 book, *Storytelling with Data*, is an exemplar in a new wave of business advice books aimed at helping business people or analysts tell use their data in more relatable ways. Her book is based on the idea that "tools will make charts for you, but they won't find the story for you" (p. 4). Knaflic's book is unique in taking an analyst through the basic communication planning process, urging him or her to have to a clear goal in mind at the beginning, and teaching the fundamental elements of storytelling to help him or her use data in relatable ways.

Information design scholars also offer applicable advice, ranging from the general to the finite recommendation about color, size, contrast, and other basic design principles. Karen Schriver (2013) addresses the process with three steps based on studies of how users perceive and retain data. Technical communicators should design their information by first grouping data into rhetorical clusters, then organizing those clusters visually, and finally signaling the relationship between the data. Michael Schrage (2013) proposes in the *Harvard Business Review* that creating visualizations for impact relies on the ability to ask the right questions during the design process. He believes the end goal should not be to convey information, but to inspire conversation. The question we should ask ourselves is not "'What's the best and most accessible way of presenting the data?' but 'What kinds of conversation and interaction should our visualization evoke?'" (para. 2).

Classes and tutorials online and through software providers are also readily available. In July 2017, a search for "data visualization" on Coursera results in around 700 available courses easily accessible online. Tableau Software, designed to make beautiful, interactive data visualization easy for the non-technical use,

offers classroom training around the world, frequent webinars, and whitepapers offering best practices on a multitude of data visualization topics.

In order to expand on existing best practices and bridge the gap between data visualization scholarship and communications research, the following research attempts to codify the current field through expert opinions.

Primary Research

Expert Interviews

This study seeks to understand the ways that data visualization is currently used and considered by those who excel within the field. I've attempted to select professionals who are ahead of the field, who create or request data visualizations for communications purposes in an exemplary or visionary way. Their opinions and descriptions of their work are treated as representative of a currently small group who thoughtfully leverage data visualization in their communication strategies, hopefully representative of a growing trend.

In order to see the relationship between data visualization and strategic communications in a more concrete way, I've attempted to use communications theories to explain the need for and value of data visualization within the following hypotheses. The interviews documented below are attempts to find answers to the following questions:

Research Question 1: How are communicators using data visualization?

- The Uses and Gratifications Theory mentioned in the literature review provides seven essential needs that bring users to media. I propose that data visualizations are primarily

chosen in attempt to contribute to the "Informative" and "Entertainment" needs of consumers.

Research Question 2: What is the theoretical use case for data visualization?

- The Elaboration Likelihood Model mentioned in the literature review suggests central processing of complex information when the user is properly motivated or has a need for cognition. I propose that data visualization can be used to encourage central processing both by attracting the attention of viewers with a need for cognition and by motivating users to become more involved.

Question 3: How can data visualization play a bigger role in the communications process?

- Of the Communications Campaign Drivers mentioned in the literature review, the "News" driver makes obvious sense as a place to utilize data visualization. I propose that those who use data visualization as part of their communication strategy use it primarily to support the "News" driver.

Method

In order to learn about the ways that data visualization and strategic communications are currently considered together in the field, I conducted interviews with experts who represent a range of perspectives. I conducted interviews between June 25th and July 7th, 2017 ranging from 30 minutes to an hour depending on interviewee availability. The first two interviews were conducted over the phone, and the last two were conducted in person. All interviews were recorded and later transcribed. Jon Christensen responded to an email I sent to Stamen Design, and all other interviewees were contacted through my professional or academic network.

Their areas of expertise are as follows:

- Jon Christensen: Partner and Strategic Advisor at Stamen Design, San Francisco, CA. Jon leads a consulting team that creates data visualizations (especially maps) for strategic communications. Stamen's clients include businesses, universities, nonprofits, humanitarian organizations, government agencies, and scientists. Jon spoke about working with the Dalai Lama to map human emotions, about visualizing the impact of climate change on hundreds of species of birds for the Audubon Society, and about helping university researchers recreate an American atlas to inform the national conversation on the historical legacy of systemic inequity.
- Brandon Leander: Data Manager at Land O'Lakes, Shoreview, MN. Brandon manages a growing team of technical analysts to support business decision-making. His team supports decision-making within animal feed marketing by analyzing and communicating data that helps marketers decide how much to spend, where to spend it, and how to interpret the results.
- Kelly O'Toole: Designer at Padilla, Minneapolis, MN. Kelly designs infographics, annual reports, and data-driven images for clients. Her most common products are charts, storytelling infographics (a page of a book with an image of a hospital and paths that lead to data points about its creation and purpose), and snapshot infographics (a pie chart of what women eat for dinner shown on a dinner plate). Her primary focus is on design, and for the most part, her graphics do not include statistical analysis. Her role is common to communications agencies, and the infographics she creates exemplify the industry's current approach.
- Lee Thomas: Professional Communicator, Professor of Information Design, Associate Director of Carlson Analytics Lab; University of Minnesota, Minneapolis, MN. Lee currently teaches Information Design and Technical Communications, and works with Business Analytics students on visualizing their data for impact. He has a well-rounded professional and academic perspective on the industry, and his expertise is in information technical communication and information design, not specifically data visualization.

Interview Insights

Jon Christensen – Partner and Strategic Advisor, Stamen Design

"Data don't speak for themselves."

- Listening carefully to the client is the most important thing
- Data should present an argument, proposition, or story
- 3 parts: Analysis and rigor, empathy and careful listening, passion for beauty and delight
- Good project management brings disparate skills together
- Be intentional about why you're doing the visualization and what you hope to accomplish within a larger strategy
- Clients have too much data and want to do something amazing with it
- Success can be tangible (increasing visits, time spent interacting with data, donations), or intangible (adding to the national conversation on inequity, giving a passionate group the ability to create their own visualizations, helping a company tell its story internally)
- Visualizers have to stay up-to-date with big technological changes while staying grounded in the history of their field

Brandon Leander – Director Digital Technology & Analytics, Land O'Lakes

"If our analyses are influencing decision-making, then I look at our team as being successful."

- Listening to the business/client and understanding their needs is the foremost task
- Data is underutilized, and needs to be interpreted in order to support decision-making
- Make data actionable in order to effect change
- Major goal is to extrapolate a few pieces of important information with clear action items

- Visualizations should operate on two levels – the immediately understandable, and the invitation to deeper exploration
- Know your audience, and meet them where they are (in terms of data familiarity, type of decision they're making, and how they want to be told)
- Primary functions: to influence decision-making; to persuade
- Data's especially important when you're telling someone what they don't want to hear
- Common gaps: understanding strategy; knowing the goals

Kelly O'Toole – Senior Designer, Padilla

"Everything we do is taking data and communicating it to different audiences in the most visual and attractive way we can."

- Use of infographics isn't always a strategic choice; sometimes it's an affordable or popular choice
- Visualization serves as an alternative for busy readers who won't put in the effort
- Infographic design is all about simplification – condensing information into bite-sized pieces
- Design perspective starts with the type of image, then plugs in data
- Designer perspective sees data visualization as a function or description of design
- Visualization makes natural sense in the advertising mindset, but is more difficult to incorporate into PR processes

Lee Thomas – Professional Communicator; Associate Director of Carlson Analytics Lab and Information Design Instructor, University of Minnesota

"Numbers alone don't always convince people. Even really compelling numbers; even really great data."

- The ability to communicate analytic findings (intersection of data and communications fields) is rare but highly sought skill
- Visual communication skills are severely underrepresented in the corporate world, and people are afraid to learn them
- Information design is about making things easy for the reader; poor design can put up roadblocks to the reader's understanding
- Communication goals should be the foundation of a visualization
- Focus attention/draw the reader's eye to the most important pieces
- Some resistance to data visualization comes from comfort with numbers – not everyone needs the visual to understand the data
- Technology and data are new, but visualization isn't
- Data is a type of content, just like words or other images
- Data visualization is a means of making an argument
- Numbers alone don't convince people – rhetorical elements like storytelling and emotional elements help

Findings

The breadth of experience represented by the interviewees in this study created a unique challenge and provided a fascinating range of perspectives on the topic of incorporating data visualization into communications content.

Brandon and Kelly come from opposite ends of the process and completely different skillsets. Brandon sees visualization as a representation of statistical findings, and emphasizes the technical and mathematical prowess that go into analysis. Kelly sees visualization as a natural way for some people to

understand any information, and emphasizes the attractiveness of the end product over the rigor of the content.

However, this range of experts also demonstrated commonalities and made some shared points. All four support the idea that data visualization is under-taught or under-utilized as a part of the communications process. Brandon and Lee both spoke extensively about the ways in which they attempt to teach data analysts or technical teams to use visualization to reach a broader audience. Jon mentioned that thinking about data as a means of storytelling or a part of a strategic communications process is new to many of his clients, and one of his major functions is helping them learn to use visualization in a strategic way. Kelly designs infographics and data visualizations that aren't based in statistical knowledge, and the data-centric or technical teams don't work directly with the design teams at her agency. That her work is considered data visualization by a large full-service agency and much of her field is in itself revealing, suggesting an industry definition with room to grow.

All four interviewees see data visualization as an art. While Brandon's work doesn't fall directly into this category, as he is primarily focused on making data actionable and real to his clients, he talks about the importance of inspiration and finding examples of data visualization that move you, a primarily artistic concept. Kelly approaches every data project primarily as an artist. Lee sees visualization as a function of design. Jon spoke repeatedly about the beauty of visualizations and the passion and humanity required to create them.

Brandon, Lee, and Jon all describe data visualization as a means of making an argument or stating a proposition. Lee specifically referred to visualization and information design as a method of persuasion, and therefore a part of rhetoric. He told the story of a historical example in which the data suggested an important flaw in a hospital's practices, but it wasn't presented in a compelling way, and was therefore ignored. Brandon's primary goal for his team's visualizations is to impact decision-making, and he describes data visualization as the only way to change closely held opinions. Jon spoke extensively about working with the client to know what kind of argument or proposition you want to make. He also told stories about

mapping projects that demonstrated the effects of climate change or of institutionalized economic inequity, therefore contributing data-based arguments to conversations that are often met with strong opinions.

While they describe their goals differently, all four share the essential goal of bridging the gap between understanding data and talking about data. Kelly takes on that translation herself, treating it as a design function. Brandon and Lee and both attempt to teach data analysts how to communicate, bringing design and language skills to mathematical or technical roles in order to make their discoveries more accessible. Jon's Project Managers bridge the gap internally, attempting to understand and bring together disparate skillsets that contribute to making data part of a conversation. Interestingly, Jon, Brandon, and Lee all focus on teaching people who understand data to communicate, while Kelly, a visual communicator, hasn't encountered data-specific training. There is no evidence in these interviews of data being taught to communicators; the inverse appears to be more common.

Ultimately, Jon's interview may carry the most weight due to his unique career. His firm, Stamen Design, specializes exclusively in bringing data visualization into the strategic communication process, a highly unique proposition that perfectly represents the aims of this project. His finished product is more complex in appearance than those of the other interviewees, and represents a slightly different approach. All three of the other interviewees mentioned simplifying data, and Lee and Kelly both focus specifically on drawing the reader's eye to the most important pieces. Kelly does so in order to make content accessible for readers who don't have the time to fully engage, and Lee does so in order to ease the transition between presentation and understanding. Brandon calls out specific findings in order to inspire action in his readers. Jon, rather than simplifying, attempts to clarify data, engaging with the reader in a more complex and sometimes more demanding way. He creates opportunities for exploration and invites the reader in, treating conversation and interaction as measures of success.

Research Question 1: My proposition that data visualization is primarily intended to fulfill the "Informative" and "Entertainment" functions of the Uses and Gratifications Theory is supported by these interviews.

Brandon's intent focus on using data to support decision-making within his organization is an obvious example of data being used primarily to inform. Jon's interest in his visualizations becoming part of the conversation suggests a desire to inform, and his stories about successful visualizations describe learning moments for the users. Kelly's focus on narrowing data into bite-sized pieces is because of a desire to make it consumable, for the ultimate purpose of sharing a bit of memorable information. Lee talks about data visualization and design as rhetoric, as means of making an argument, and as a way of reinforcing a message. He also talks about processing, and says that visuals combined with language can open up access to more of the brain, easing the transition between your presentation and the viewer's understanding.

Kelly's work makes the strongest argument for data visualization that users are intended to perceive as entertainment. She describes her work as making data interesting, attractive, and eye-catching, usually used on social media, an answer to the modern desire to stand out. While Brandon accepts that his own work is not inherently entertaining, he finds inspiration in visualizations that are pure entertainment, like those showing insights about sporting events. Jon says that one of the things his team always considers when producing visualizations is "passion for beauty, for delight, and fun, surprise, and all of those kinds of wonderful attributes that make life worth living," a perfect definition of entertainment.

Research Question 2: My proposition that data visualization is being used to encourage the central processing described in the Elaboration Likelihood Model is not supported by these interviews. This prediction was based on observations in the literature review, especially on case studies of data journalism. While this concept may still be relevant to data journalism, the experts I interviewed about data visualization for business communications were much more interested in modifying data to appeal to peripheral processing than in using data to inspire central processing. Kelly spoke extensively about breaking data up into bite-sized

pieces to make it consumable for the reader, Brandon repeatedly mentioned the need to produce tangible and actionable learnings for his readers, and Lee teaches design basics to analysts to keep them from setting up roadblocks to their readers' understanding. Jon's work may offer an exception, as he produces the most complex products, and he listed both increasing the amount of time users spend with a visualization and the ability to impact complex conversations as measures of success.

However, the idea that data visualization can be used to inspire central processing comes from studies described in the literature review that discuss interactivity. It is possible that increasing interactivity and the ability for users to directly engage with data increases the personal relevance they feel to the data, and in turn, increases the likelihood of central processing. Based on these interviews, user response and the differences between interactive and static visualizations can't be considered.

Research Question 3: My proposition that data visualization is primarily used to support the News Campaign Driver met with mixed results.

In some scenarios, visualization is being used to support the News Driver. The primary goal of News is to convince potential customers of a unique selling proposition. Using data as a tool for persuasion makes obvious sense in this context. The above evidence that data visualization is being used in an attempt to inform consumers also supports this idea- informing is the major function of the News Driver.

However, suggesting that data visualization's use is limited to the News Driver minimizes its impact and excludes other functions for which communicators use data visualization. The interviewees see data visualization as rhetorical tool used for argument and persuasion, a method of telling stories, a type of content, and variably an addition to or substitution for more traditional images used in campaigns. All of these descriptions are broad, and resist categorization into a single piece of the strategic communication process.

For example, another driver, Emotional Bond, is a less intuitive but equally viable fit based on the interview evidence. Creating an Emotional Bond relies on building involvement, something data visualizations do very well. Jon's examples of the ways his maps have impacted conversations suggest that they have a part in building emotion. He also describes his visualizations as having to find ways to surprise and delight, another component of the above observation that the experts interviewed here view data visualization as an art. When viewed as an art form, data visualization is a natural choice to support the Emotional Bond Driver.

Discussion and Recommendations

Discussion

The above literature review and expert interviews are explorations and clarifications of the ways in which data visualization can interact with a strategic communication process. The interview findings discussed above provide an opportunity to better connect the fields of data visualization and strategic communication, and help clarify the possibilities for the communications field.

The case studies covered in the literature review that describe the state of the field for data journalism are revealing. They suggest a field that is still growing rapidly, and best demonstrated by large teams with abundant resources. The complexity, interactivity, and transparency on the rise in data visualizations in journalism could have exciting applications for communications content. For the most part, the experts interviewed in this paper haven't begun to capitalize on those trends, but it's possible there more may be room for greater use of those ideas than has been demonstrated so far.

Data journalism case studies also suggest a field that's currently being driven by technological changes, a possible pitfall for an increased focus on data visualization in communications content. The

experts interviewed in this paper see the need to keep up with changes in technology, but they also base their work on a strong theoretical and historical foundation, and therefore create visualizations to execute strategies rather than to demonstrate technological prowess. The data journalism case-based observation that interactivity doesn't always support the story is an excellent caution for communicators deciding how to use data visualization to support their goals. The above interviews reinforce the importance of using visualizations exclusively to support specific communication goals.

As demonstrated in the literature review, there are many available sources of best practices or general guidelines. Both Tufte and Cairo are highly readable for the literary-minded, and provide an excellent introduction to the field. Cairo's steps are a little more specific, but many find Tufte's visionary approach transformative. For the communicator who prioritizes structure over readability, Stephen Few's work contains greater detail about the science behind visualization and specific steps to make visualizations effective. Knaflic offers business advice, much of which should be intuitive to the communicator, but which is concrete and easy to follow. As Jon Christensen pointed out in our interview, there is no canon, but there are many excellent resources available.

The gap is in communications-specific resources, or articles emphasizing the need for communicators to seek out existing best-practice guides. While this gap is certainly a function of the interdisciplinary approach required to address data visualization from a communications perspective, it also reflects on the ways experts in the field are thinking about the marriage of data visualization and communications today. The experts interviewed for this paper, as described above, detail efforts to teach analysts to communicate. Absent from any of these conversations was the suggestion that we can and should be teaching communicators to understand and present data. Whether this is an oversight or intentional would provide excellent grounds for further study.

In an attempt to make a small contribution to the non-canon of existing best practices and business advice books, I've attempted to codify some of the learnings from this paper, however rudimentary, into a

few additional recommendations specifically for communicators looking for ways to integrate data visualization into their content.

Recommendations

- When thinking about how to use data as part of a communications process, picture ways that your data can be used for the "Information" and "Entertainment" functions of the Uses and Gratifications Theory.
- Treat your data as a method of persuasion, a means of argument, or a rhetorical tactic. Your data is persuasive type of content that is most effective when paired with traditional forms.
- Form communications goals based on carefully listening to your client and understanding their business. The seven immutable Campaign Drivers provide an excellent framework for describing your goals. Data Visualization makes obvious sense within the News Driver, but shouldn't be limited to it.
- Based on your readers and your goals, decide how much you can afford to clarify and engage, and how much you have to simplify. Is your reader in a hurry, or are they willing to go on a journey with you? Do you want them to make a decision, or do you want to inspire a conversation? If your goal is to simplify, rely on Stephen Few and examples of charts shown in business communication or on infographic models. If you prefer to clarify, Cairo's book and examples of data journalism may be more inspiring.
- When building a data department, you need technology, artistry, journalistic sense, mathematical rigor, and communication skills in harmony. The combination of roles is not important; just focus on the skills. If skills are spread widely across roles, hire project managers who can bring everyone's knowledge together.

Limitations and Future Research

Limitations

The pool of interviewees for this study was both small and wide. Interviewees were chosen in order to represent a variety of perspectives on the same topic, which resulted in a few common themes and surprising differences as planned. However, because of their varied roles, the interviewer dramatically tailored questions to the interviewees' knowledge sets, so they did not answer the same questions. While an interview with one person from each type of position is anecdotally interesting, a few more interviews in each group could have provided a more cohesive story. The limited sample size was chosen due to the scope of this project and the availability of qualified participants.

This project is based on the observation that data visualization is underutilized or misunderstood as a component of communications content. The interviews were conducted with experts who generally supported that assumption, but as experts in the field, provided examples to the contrary. While interviewing experts who excel at communicating with data, I am unable to provide examples to truly support the case that data visualization is underused in communications.

Opportunities for Further Research

A wider-scale study of data journalism could help establish a state of the field and provide interesting implications for communications. Many case studies are available, but they are primarily regionally based. While the conclusions that I saw in regional studies supported one another, they do not necessarily make up a whole when taken as a group.

The research in this paper focused exclusively on creators of data visualization in an effort to address their goals. It could be helpful to pair this study with a results-based study focused on end users. Discovering

what readers actually think and of these visualization and how they interact with the data these experts are creating could provide a more well-rounded set of recommendations.

The proposition that communicators use data visualization to encourage central processing according to the Elaboration Likelihood Model was not supported for business communication, but still offers interesting possibilities for data journalism and for interactive visualizations. Asking the same question with a different sample presents an opportunity for further research. As noted above, this research was based exclusively on creator goals, and it is possible that users are more likely to process visualizations and accompanying content centrally, even if that is not the intention of the creator. This could be an interesting question to include if further study focused on the user perspective.

Conclusion

This paper is based on the premise that data visualization is under-taught and under-represented in the field of strategic communication. The literature review and interviews above support this premise and attempt to provide a theoretical basis for its increased application. The purpose of this study was to bring together currently disparate fields that could both grow through increased overlap.

Many excellent examples of best practices and guides already exist, so the missing link for communicators isn't technical, it's theoretical. Learning how to think about data visualization as a part of strategic communication planning is the difficult next step for communicators. To that end, I've included a few simple guidelines that I haven't found elsewhere in the literature, intended to help communicators envision the possibilities for data visualization and seek out data education. I look forward to continuing to track the rise of data visualization as a part of communications content.

References

Brehmer, M., & Munzner, T. (2013). A Multi-Level Typology of Abstract Visualization Tasks. *Visualization and Computer Graphics, IEEE Transactions on, 19*(12), 2376-2385.

Bycoffe, A., & Wasserman, D. (2016, October 05). What Would It Take To Flip States In The 2016 Election? Retrieved July 01, 2017, from https://projects.fivethirtyeight.com/2016-swing-the-election/

Cairo, A. (2013). *The functional art : An introduction to information graphics and visualization*. Berkeley, California: New Riders.

Coddington, M. (2015). Clarifying Journalism's Quantitative Turn: A typology for evaluating data journalism, computational journalism, and computer-assisted reporting. Digital Journalism, 3(3), 331-348. doi:10.1080/21670811.2014.976400

Few, S. (2012). *Show me the numbers : Designing tables and graphs to enlighten* (2nd ed.). Burlingame, Calif.: Analytics Press.

Hans Rosling - TED Speaker. (n.d.). Retrieved July 01, 2017, from https://www.ted.com/speakers/hans_rosling

Hiebing, R., Cooper, S., & Wehrenberg, S. (2012). *The successful marketing plan : How to create dynamic, results-oriented marketing* (4th ed., fully rev. and expanded.. ed.). New York: McGraw-Hill.

Hilligoss, S., & Howard, T. (1999). *Visual communication: A writer's guide*. New York, NY: Longman.

Hope, D. S. (2006). Introduction: Identity and visual communication. *Visual communication: Perception, rhetoric, and technology*, 1-27.

Katz, E., Blumler, J. G., & Gurevitch, M. (1973). USES AND GRATIFICATIONS RESEARCH. Public Opinion Quarterly, 37(4), 509.

Knaflic, C. (2015). *Storytelling with data : A data visualization guide for business professionals*. Hoboken, New Jersey: Wiley.

Krautli, F. (2013, November 02). The Tate Collection on GitHub. Retrieved July 01, 2017, from http://research.kraeutli.com/index.php/2013/11/the-tate-collection-on-github/

Otten, Jennifer J, Cheng, Karen and Drewnowski, Adam. Infographics And Public Policy: Using Data Visualization To Convey Complex Information. *Health Affairs* 34, no.11 (2015):1901-1907. doi: 10.1377/hlthaff.2015.0642

Patti, C. H., Hartley, S. W., van Dessel, M. M., & Baack, D. W. (2015). Improving integrated marketing communications practices: A comparison of objectives and results. *Journal of Marketing Communications*, 1-20.

Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. *Advances in experimental social psychology*, 19, 123-205.

Redish, J. G. (2007). *Letting go of the words: Writing web content that works*. Morgan Kaufmann.

Schrage, M. (2013). The Question All Smart Visualizations Should Ask [Harvard Business Review Blog Network]. Retrieved April 14, 2013.

Schriver, K. (2013). What do technical communicators need to know about information design? *Solving problems in technical communication*, 386-427.

Segel, E., & Heer, J. (2010). Narrative Visualization: Telling Stories with Data. *Visualization and Computer Graphics, IEEE Transactions on, 16*(6), 1139-1148.

Tufte, E. (1997). *Visual explanations : Images and quantities, evidence and narrative*. Cheshire, Conn.: Graphics Press.

Tufte, E. (2001). *The visual display of quantitative information* (2nd ed.). Cheshire, Conn.: Graphics Press.

Van Wijk, J. (2005). The value of visualization. *Visualization, 2005. VIS 05. IEEE,* 79-86.

Young, M. L., Hermida, A., & Fulda, J. (2017). What Makes for Great Data Journalism? A content analysis of data journalism awards finalists 2012–2015. *Journalism Practice*, 1-21.

Appendix

A – Interview Guide

These questions served as a rough guide for the interviewer, who tailored each interview to the interviewee's expertise and time limits. Some questions not on this guide were asked as follow-ups or attempts to encourage the interviewee to talk about his or her own interests. Questions considered central to the goals of this paper, which were asked of all participants, are in bold.

Introductions and Descriptions:

- **Tell me more about what you do. What types of visualizations do you create or request, and what types of data do you use?**

Goals and Thought Process:

- **Are there common goals for many of your visualizations?**
- What do you think about when you're designing a visualization or deciding to create a visualization?
- What kind of response to you hope to see from readers/users? Do you have a way of knowing what actual responses have been?

Big Picture:

- **How do you see data visualization as part of an overall communications strategy? How does it support the big picture?**

- How is your work leveraged to enhance content?
- **How does data visualization fit in with/replace/enhance traditional forms?**

The Field:

- **How do you see the field of data visualization right now?** What are organizations good at/where are the gaps?
- Are there outstanding questions in the field? What are you still hoping to learn?
- Who do you see as the leaders in the field? Who's doing amazing work or teaching?
- What changes do you see coming to the field, and how do expect them to impact your work?

B – Interview Transcripts

Interview – Jon Christensen

Interviewer: Would you tell me more about what Stamen does and your role as a Strategic Advisor?

JC: What Stamen does is we're a technology and design company, and we do mapping and data visualization and strategic communications and storytelling, and I guess a lot of what we do is work with clients to figure out what are the stories they want to tell with their data, what are the important things they want to communicate, and what are the outcomes that they would like to result from that.

So, using this whole strategic communications framework combined with very innovative design, beautiful design and interaction design. That's the core of what we do.

And then there's a lot of technical, you know, a lot of programming, a lot of technology and technical details and a lot of design thinking and process that goes into that.

My role as a partner – Eric and I are business partners, we are the two partners of the firm, and my role is as a strategic advisor is to give Eric (he's the founder, CEO, and Creative Director) strategic advice on business and also to get involved with the kind of bringing a sense of/attention to strategy in the overall projects and strategic communications and how that fits with the strategies of clients so that we really make sure that we understand our role in their larger strategy, of which this particular project is a part.

Can you tell me more about that client relationship and how organizations leverage your skills to enhance their content? Do clients typically come to you with an idea of where you fit in to their communications process and overall strategy?

It can really vary a lot. Some clients come with a very clear idea of what they want and what they want us to build for them, and some have a lot of really interesting data and they don't know what to do with it. They know/they have a sense or a hunch that something should be done with it or that something powerful could be done with it, and some clients have a very clear sense of how projects like this (mapping, data visualization, storytelling, communications) fit into their strategy, or creating an interactive product or program fits in with their strategy, and some don't. For some clients, the idea of thinking about this kind of project or work as strategic communications is new to them, and for some, thinking of it as storytelling can be new to them too, so there are some times where there's a process – it really starts with listening carefully to client and figuring out, and then a process of discovery together and testing out the whole suite of ideas and what we discover together to figure out what's going to work best for them.

When you do this type of consultation, and you're working with clients to figure out what to do with their data and more ways that they can use data, how do you see the kind of work that you do fitting in with, replacing, or enhancing the traditional forms that some of them might be more used to?

I really see them as going together. I think it's most useful to think of them together. Data don't speak for themselves, whether you want to use that as a plural or singular, data doesn't speak for itself. I think maps often tell stories, and once you have data in some form that is communicating something, it's at least communicating some kind of argument or proposition, and there's often a story about it, whether that's implicit or explicit, I think it's really best that everyone's aware of that, and that's part of the clear thinking about what we're doing together so that we're really in control of all of those elements of communication, which would be in addition to the design and form, the particular choices of that is also how things are framed – what arguments you're making, what propositions you're putting out there, what stories you're telling – how do those fit with what you're trying to communicate and what you're trying to achieve. It's good to have a clear handle on all of that as you work through the process.

I think that some of what we do is very very new, and surprising, and delightful, and we're using new tools all the time, from technological tools that one never really sees, from the back end of data management and analysis, through using different programming languages sort & process that and then represent it, to front end interactions and designs, and even now tools like machine learning, neural networks, and artificial intelligence, virtual reality – those are all really new, but I also think that fundamentally we're in some ways still working in forms that have very old roots. Particularly if we think about narrative and storytelling as being part of that, very very old roots. Particularly if we think about that many of the forms of representation in maps and data visualization have their roots in the 19th century. Particularly this explosion of visual representation of data of the late 19th century and early 20th century. There are new forms being invented, but a lot of them can be traced back to some of those old forms of how you represent data on maps, how you represent movement, how you represent proportions of things, how you represent movement, how you represent change over time. I think there are always new things under the sun, but they also have a history, and they're closely related, to step back, to overall thinking about "What are we trying to communicate? What work do we want this communication to do in the world?"

On the note of what kinds of work you want your communications to do in the world, are there common goals for many of the visualizations that you create? Do you find yourself trying to inform or engage, or do you form those goals more specifically around a client's overall communications strategy?

We always really strive to do a few things. One is to be rigorous in how we think about what we do, so to have our heads in the game. To really think clearly and analytically and use rigorous methods and make sure that what we're communicating is accurate and informative.

The other thing is to have our hearts in the game. We want to be empathetic. We want to start with listening very carefully to what the client – and our clients range from businesses, to universities, to scientists, to nonprofit organization, humanitarian organizations, government agencies, so we have all kinds of clients – but really listening carefully. And then, with that, also being engaging and personal, understanding how people interact with the things that we create and putting ourselves in their shoes, which is such an important part of communication as well as the design process, and particularly interaction design.

And then I think the third thing is passion for beauty, for delight, and fun, surprise, and all of those kinds of wonderful attributes that make life worth living.

So it's obvious that you approach your work in a really cross-functional way – you mentioned technical skills, valuing beauty, communications knowledge – where do the people in your organization come from? Are these people with technical backgrounds, communications backgrounds, or a little bit of everything?

We certainly need to have people with really great technical and programming skills, and so… Do you know Andy Kirk's book, *Data Visualizations*? I think that Andy's typology of the seven different hats of data visualization is a pretty good one. We have and have to have really great Project Managers. Those people can

come from a variety of backgrounds, but they really give what they've learned over time. This is really something that isn't taught much if at all, but is learned – project management. Those people can come from a variety of different backgrounds, but they all have communication skills, team skills, patience, empathy, listening skills, and the discipline to keep things on track, and to do it in a way that is herding cats but keeping the cats pleased, and understanding. You've got our data wranglers (what Andy calls data analysts) who really have the technical and programming/technology skills to manage and organize the back-end databases, make sure that they're communicating with the other parts of what we build, that are cleaning and sorting data and doing so in rigorous way, cleaning, transforming data. And then designers.

I think each can come from different areas; it's not necessarily that there's something...some people can wear multiple hats, but often there are people who are really strong in one area or another, but they're good at working on teams and communicating with one another. The designers can come from other fields that aren't necessarily data visualization or mapping or cartography fields. In these times, they're comfortable with that kind of design, on paper, or on a whiteboard, sketching, Illustrator, but also working with the technologist or developer to put those into interaction. And then you have your developers and programmers.

So all of those people can come from different areas. Those are sort of like the core part of our team. Then there's folks like what Andy calls the Journalist, or the Reporter, sometimes different people play that role. I would think of that as the person who's really looking for the story, as much someone thinking about strategic communications and how that fits as it is someone who's sniffing out an angle or something like that. Andy has some other roles, like the Scientist, the thinker who makes sure the research embedded in this is rigorous, and we sometimes do have that person as a special role, and sometimes it's other people on the team who play that role, or sometimes it's someone on the client side who plays that role. He also has a role for a Communicator, and that often overlaps with the Project Manager role. So I don't think, and I don't think he's saying, that every team has these seven people; it's that it's important that someone is playing these different roles. Sometimes people play multiple roles depending on their experience and training on a project, and sometimes some of those roles are fulfilled by someone on the client side.

When you and your team are deciding what type of visualizations to produce, or deciding whether or not to produce a visualization for a client, does your team have some kind of a rubric or a best practice – things that you always think about when you're setting out to design a visualization? Or does that depend more on the scenario?

We have method more than a rubric. In some cases it depends on project. But we have a method that we go through. It's designed to ensure that we're paying attention to all the things we just talked about. There is a process of talking with the client – what we might call a discovery process, what I would say is really listening carefully to the client and asking questions that are sometimes straightforward like "Where's the data? What is the data? What shape is it in? Can we see some of it right now- can you send us some so we can get a feel for it/see what it looks like/see what might be done with it?" Really talk with the client about what is it that they want to accomplish or communicate. How does it fit into whatever the larger strategy is so that we understand the context of what we're doing, in the process of develop a statement of work with them. The SOW is a really important document, and it can change can change, it often does somewhat, but it's often a really good statement of what we're doing together. It starts out with our statement of what we heard. Our understanding of what we're doing together, why we're doing it, what we're trying to communicate, how it fits into your strategy, what we hope to accomplish together. That statement is a really important test of whether we all have a mutual understanding of the important things, and what we're doing together.

Then we have a process where we lay out what our process is going to be, our timeline, either we know what we're going to build or there's a process of discovering together if we don't know from the beginning – sometimes we do and sometimes we don't. Then we have at the beginning of projects an actual process of discovery at the beginning of the project once we've started. So we've done some discovery in the process of developing that Statement of Work together, and hopefully we've gotten pretty close, but we have a really intentional process of design discovery together. We get together, we have a kickoff meeting, we brainstorm, sketch on whiteboards, and so on and so forth. Sometimes we'll have the data, we'll look at it –

this might be anywhere from several hours to a day to a couple of weeks. We're in this process, and we create a shared slack channel and a shared blog, we post frequently what we're seeing and discovering, what we're thinking about it and getting feedback, as open an ongoing conversation as client wants with this. A process like this is really open, iterative, and it's simultaneously so that this kind of discovery, data analysis, and trying things out with the data, is happening at the same time as thinking through the design possibilities for interaction, for representation for data, and the storytelling, argument, or strategic communications, all of those things begin to align into what we might call a sketch or a first draft that is often that is actually built so there's interaction in it. It's not just a sketch on paper, you're actually seeing it- we're working with the real thing. We want to get our hands dirty with data as soon as possible, and be working with the real thing and iterating with the real thing with clients.

You've mentioned several times how important it is that you listen to the client, and that both they and you understand the part you play in their larger process. Do you see any common themes in why clients come to you and what they hope to accomplish with your help?

Yeah, I think the most common theme is that clients, like all of us, are awash in data, immersed in data. Sometimes we can look at that and say "A client in the Bay area wants to map some protected areas in the Bay area." That might not seem like a lot of data, but to them, it's a lot of data. It might be about the lands, and ownership, and the species that are on them, and the people who visit them, and so it adds up to a lot of data. Or we might work with a client that has an ongoing collection of satellite imagery from around the globe, so we're really talking about huge amounts of data. The common theme is that they come to us because they want to do something amazing with their data. I translate that as they want to communicate something important and powerful and compelling. Or they want to tell a moving story that will help them achieve some kinds of results or outcomes. They come to us because that's what we do; we have a good track

record of working with clients, and of doing technologically sophisticated, artistically beautiful and compelling work.

There's a lot that people can do nowadays at a basic level. Anybody with some Excel skills can do a fair amount with a fair amount of data before it becomes overwhelming, but somebody with sophisticated Excel skills can do a lot. You can create some pretty basic but good visualizations that help you understand your data and make decisions about it, but it's when you really want to make those possibilities for discovery, for interaction, for storytelling and communication, that people come to us, particularly when they know it's important that their work has impact.

Do you have clients that come to you without strong strategic goals or without a clear idea of what they want to accomplish?

Yes, for some people, and for some clients, bringing strategic communication framework to this is something new to them. For some clients, thinking in terms of narratives or storytelling can also be new to them. So they may have some data and they know they want to visualize them, but they don't think of it as a strategic communication challenge – even if it's just an internal project – say, giving employees or executives a tool to understand what's happening in their own companies – they might very well understand the strategic importance of the data, but they might not bring a strategic communication frame to that. This too is a strategic communications problem too if what you're wanting to do is make sure that the data is communicating or you're communicating clearly with the data so that execs can understand and take action on it. It's not uncommon that people don't come thinking that right away, but like good work in other fields of strategic communication and storytelling, sometimes it's really fun when you're working with a client and with that Statement of Work, you give them back what you're heard from them, and they say, "Oh, this is a really great way of telling our story." Or "I hadn't thought of it like this, and this is really helpful." When we do work like that, it's very rewarding, because that's an important part of our work.

You mentioned Andy's book – are there other leaders in the field that you look to, learn from, or find particularly inspiring?

This is funny, because I just did a review of a couple of books – let me see if I can find that.

I just want to refer to this. So I started writing a review of Andy Kirk's book and a review of a book by Stephanie Evergreen, that's called *Data Visualization: The right chart for the right data*, which is really about some basic Excel skills, which I think is valuable for a lot of people. The world is full of people trying to do basic good work with Excel, and that's important.

On the journalism front, Alberto Cairo does great stuff. His book *The Functional Art* is a very good introduction to information graphics and visualization. Stephen Few's work, Manuel Lima's inspiring, mind-bending things. And then there's cartography, and people like Hans-Ulrich Obrist's *Mapping it Out: An Alternative Atlas*.

I continue to be inspired by old maps and old data visualization forms, from Alexander Von Humboldt on. And even earlier, beautiful ones.

We also do things like the Atlas of Emotions, working with – what's the scientist's name - working with the Dalai Lama, Paul Ekman and his daughter Eve, and there are things like that where the Dalai Lama said that we needed a new map to get to the new world, and we need a map of our emotions so we can understand them; some understanding of how our emotions are affecting us so we can more readily find a state of calm as we experience them. There's really beautiful work being done by a lot of different people. I find every day inspiring cartographies of emotion that put feelings in different places.

Colin Wehr's work and his book *Information Visualization* in particular, on the scientific foundations of information visualization. And then there's work like my colleague Joanna Drucker's work *Graphesis: Visual*

Forms of Knowledge Production, that is really looking at the ways in which visualizations have historically constructed meaning.

I would say this isn't a canon – the field is both so diverse and always changing, and far from settled, and it has lots of different roots and branches, and lots of people doing really excellent and inspiring work, that have been doing so for decades or even centuries. I like to have a capacious ecumenical view of it, and be guided by the understanding that maps and graphs and visualizations are some of the important forms that we use to understand our world and make meaning in our world, and understanding them in that context is what really guides me, and then thinking about and choosing the forms that are most appropriate and powerful and compelling for whatever the work is at hand.

Do you keep in touch with clients or hear back from them after you've produced things that they've published or shared? Do you get a feel for how their customers or readers are using or responding to what you've created for them?

Yes, as much as possible. We try to have return clients, so we do hear. As I said, we're very very interested in what those outcomes are, because that's an important part of the whole point of doing all of this. The world is fast-moving, and changing, so sometimes we don't get to hear as much as we'd like, but we try and it's really important for us. When we can hear about that and learn from it, that's particularly useful. Obviously, we have clients come back to us…. But when we hear that the project we did for the Audobon Society, visualizing the changing range maps that hundreds of species of birds are expected to experience with climate change, and this was part of a new campaign website redesign, that we did with collaborators at Mule Design, and we hear that it increased traffic on their website by several-fold, and increased engagements on the website, increased memberships and donations, that's the kind of stuff that we love to hear.

Are there other common success stories that you hear from clients?

Well, sometimes you can measure these things in very tangible ways like that, (like the number of views, the time that people spend engaged with interaction, whether they then take action that the client is hoping they'll take). In some cases we have those kinds of quantitative measurements, and other times, it may be more qualitative. We helped a client communicate something, an important message about health outcomes with changing policies, and sometimes that might have some quantitative measurement in terms of conversations or coverage in the media. Other times while we might have some of those quantitative measurements, much more qualitative assessments may be really important. Like the work that we did for the University of Richmond on "American Panorama," which is a new atlas re-imagining and reinventing the "Atlas of Historical Geography of the United States," which was an atlas published in 1930, where if we look back, a lot of the forms we're using now, obviously in different ways, because it was a book that was printed on paper, those forms and genres of mapping change over time and space were invented, or modified, or developed in very important and creative ways. We worked with the University of Richmond Digital Scholarship Lab to bring that in to the 21st century and create tools for them to be able to create their own maps. Part of that is measured in the intangible – have we really helped change how people see a historical atlas, and have we changed how people understand the forced migration of slaves within the Antebellum south, or immigration from around the world to American cities over time. We're part of a larger scholarly conversation and public conversation in that case. Another part of that measures success in that we've seen them develop two new maps and narratives that have been added to the historical atlas *American Panorama*. One was mapping redlining instances around the country, and were the maps that they created using the tools that we built for them. So in creating this new *Atlas of Historical Geography* we created a set of open source tools for researchers to create their own maps, and so they've gone on to create a very powerful map about redlining around the country, that widely became part of conversations around the country about the historical legacy of that discrimination and segregation and inequity and housing opportunities. And then they went on to create another map of presidential visits outside the United States that was a fun, interesting map.

So sometimes it might be measured in very… the fact that they created these two new maps and interactive stories is a significant measure of success; that they became part of wider conversations is a great measure of success. That might also spill over into a company – that we helped them tell their stories to customers or employees or externally as part of their brand, and they're happy with what we can bring to help them with their storytelling or their brand, or otherwise there might be very very concrete "you helped us increase our membership and revenue and engagement by a factor of X."

We talked about technology and how quickly things change in technology, but you also mentioned that what you do is firmly grounded in narrative history. What big changes do you see coming to the visualization field and how much do you anticipate that they'll change the kind of work you'll do?

I guess the short answer would be that big changes are always coming, and they are going to affect us and our clients, and that's why it's really important for us to be on top of the latest changes and opportunities in technology, and to incorporate those into our practice, as well as having this grounding in the history of communication, beautiful mapping, and visualization, and good design. I think that obviously the whole world of big data is going to continue to multiply exponentially, and how we deal with that in all walks of our lives will be important, in that tools like machine learning, neural networks, artificial intelligence, algorithms, will be super important, and we're incorporating those into our practice. That broad field of artificial intelligence, whether it's algorithms, machine learning, neural networks, that is of increasing importance in making sense of big data in our world and doing analysis and making decisions, and it's both a huge powerful opportunity and tool as well as something we really need to understand and be conscious about. We're about to launch a big project tomorrow that is both a really cool tool –I'll send you a link when it comes out – a really cool tool and demonstrates the power of machine learning with satellite imagery looking at cities, but also allows people to poke at it and understand limitations. So understanding both the power and the limitations of tools like this is really important. And then I would say certainly VR in different forms is going

to play an important role. Then there's going to be stuff that we don't' even know is coming, and we just have to be open and ready to embrace and understand and take advantage of it.

Interview – Brandon Leander

BL: How you introduced your project – it is a common problem. As far as visualizations and how you tell a story with data – I think that's the challenge that a lot of us face, working with data, how do you make that data come to life, and for what audiences. I think that's actually one of the biggest challenges that I've seen – based upon the different audiences, their normal way of receiving visualizations or seeing data.

Interviewer: Can you tell me about the team that you're putting together and the work that you do?

BL: Let me rewind a little to tell you about my team, my background, as far as where I've been – that kind of leads into my team. I've been at Land O'Lakes for 12 and a half years combined. I took a 3-year journey away from Land O'Lakes. Part of that time I spent in New York City, at Automatic Data Processing, and then I moved back to Minneapolis and worked at Target. So my background has been in various roles and various departments – I've worked in Accounting, Supply Chain, Marketing, IT – I've kind of bounced around a little bit. But really it's always been in this space around how to use data to improve business decisions and/or business processes. So I'm a huge believer that technology can be enabler, but it also can be a change agent. So that's really how I look at it. I'm always doing different projects using data and technology as a change agent.

What I'm working on now – My current role is Director Digital Technology and Analytics, as part of our corporate marketing team. What we've tried to do at Land O'Lakes – and I know you know a little about

Land O'Lakes – I've spend about 4 years of my career in in Purina, about 2 years of my career at Land O'Lakes in our Winfield business unit, a year in our IT group, and now a year in our corporate marketing group. So what I've been tasked with is a unique challenge about how do we make our marketing data be a strategic asset? So what looking for as I'm building my team is people who can partner with marketers, merchandisers, or whomever else, to get them information to make better decisions.

I think data is extremely underutilized, along with the ability to look at data and make good decisions. Sometimes people want to look at it as black and white – by no means is data the be-all and end-all; you still need smart people to understand and interpret it, and you still need business context. So what I've been doing, as part of our corporate center, is building out analytics teams to support our marketers. How my team interacts with marketers and peers – they have a wide breadth of things that they're responsible for, and they don't necessarily have the time to dig into the random data sources we have for sales, for social media, paid media, whatnot. So what I'm building is a team with three levels of analysts.

One of them is a Digital Analyst – their job is really understanding our website, what can we do to help our teams as they do development year-round on our website, and how can we build that website to generate leads? Purina is really about generating leads, so in that sense, we're salespeople. The Digital Analyst is really focusing on web, Adobe analytics, how do we tag campaigns so if we're going to spend $500,000 on a cattle campaign to support that business, what are the tactics we should be using to partner with and engage with people? The digital analyst is probably two to five years of experience. They may have an analytics background, but more importantly, but they're more about the curiosity than having a specialized skill. So the tools that they're using - Adobe Analytics is their primary web analytics program. They use Excel some, or Tableau. We use Tableau some and Microsoft power BI. They're really tasked with understanding what are some key insights, and what are some things I can take from that? They don't just provide reports – people don't want to just see a report. They want to know "what do I need to do with this?" So how do we make that data actual? So getting into the visualization thing – it's not just about pretty charts, it's ultimately about what is the story that you're trying to tell, and what does that person need to do with it. That's always where that gap is, and I've failed many times presenting in the preceding part – then you look at their face, and

they're like "Yeah, but what do I do with it?" So my boss for the past year, year and half, one of the things that she's really been good at is helping me narrowing it down to one or a few things you want someone to take away from your presentation, your chart, your analysis. Whatever it is that you're going to be presenting, what is the one or two things you want people to take away. Because really when it comes down to it, they can't really absorb or remember much more than that anyway.

So that's my digital analyst, and the next level is a Marketing Data Analyst. This is someone who has probably anywhere from 5-10 years experience, and has undergrad in math or statistics, and potentially a Masters Degree in economics or math, but who understands and knows those data sources. They're probably my heaviest lifters as far as doing data analytics and telling the story across marketing. Very very heavy users of Tableau. We're kind of doing a multiple-pronged program. So one of things we're doing is ingesting and storing all of our own marketing data – historically our marketing agency would do it, and we have six different agencies, so all of the different places – we didn't store it; we weren't doing any advanced analytics on it. So our Marketing Managers would get a report from the agency, and then they would do their own work with sales data. It wasn't very cohesive to the marketer, and the other thing is it didn't enable us to advanced analytics – our own data modeling, attribution modeling, customer journey analytics, and whatnot. So my Marketing Data Analysts really have the main knowledge about the business unit, because they're part of and dedicated to a specific business unit. That part has been really interacting directly with the Marketing Managers, or even Marketing Directors or Marketing VPs, and really understanding what are the tactics the marketers are trying to do and finding ways to tell the story of what's working and what's not. We call our team Switzerland – we really don't have skin in the game whether it works or not – that's critical for an analytics organization. You're not biased. Because it's so easy to be biased in that situation, and that's historically what we ran into with our agencies – agencies are biased because we gave them money to go do something, then they gave us the reporting on whether it works or not. Typically, they're not going to come back and say that it didn't work. It's ok that it didn't work, but agencies are always trying to put some kind of spin on it to say that it worked, even though it didn't. So I'm setting up my team as the truth-tellers or neutral parties, saying "This is how you spend your money. This is what you hope to achieve - let's set up a goals

framework and find out if it worked. Let's stop spending money on what didn't work; let's start shifting money into what's working." So really getting that near real time can lead to making better decisions. That's where were doing visualizations – because we are taking data sources you may be familiar with, or website data, but how do you use it? So, one of the analyses my team did included 10 different data sources. How do you get 10 different sources, or 650 data points down to "here's the clear takeaway"? So that's a lot of the visualization – in doing the analysis, the visualization is usually last part, but it's probably the back 25% of the analysis. Once you've done the analysis, or when you're doing data discovery, you can play with the data using different visualizations that are popping or that you're identifying. When you think about visualization, is it you as an analyst trying to discover something, or trying to present something? Because they kind of take two different paths.

So the last role that I'm going to include – the 3rd role- is data science capability. You really have to have a Masters at a minimum, potentially even a PHD, in Data Science, Statistics, Economics, something in those types of categories. There you're really able to start doing some advanced modeling, and understanding things that a mid-level analyst wouldn't. It's a different skillset, really doing the advanced data science and understanding how to filter out the noise. That's a skillset I want to bring in to our team. I'm still having fun conversations with our executive team on the value of those. You get back in to how do you know the value of data and how do you show the value of analyses, and how do you get the exec team to pull it and want it and change how they're used to making data-based decisions. Because they're used to using Excel spreadsheets – that blew my mind when I was at Target – you had these four tabs, and on each one, there were probably 200 to 400 data points. How do you actually get the real thing that you want to look at to pop pout? The thing is that there was so much noise, and depending on who was in the audience, they would always go to the same cell that they wanted to look at, but there was no way to see the trend, no basis of context. The number one challenge for me is how do you get an executive to – it's not even just trust the data – it's more of getting them to change the way they're used to seeing it being represented. I'm a huge Tableau fan, but even in that world, and on various visualization blogs… my theory (not a proven theory – I think the hard thing sometimes with some of these visualizations is that some of them can be so good, from a data

perspective that people get lost in the visualization, versus what you're trying to pull away from it. I think sometimes executives are so used to seeing that Excel spreadsheet with three bullet points on it, presenting them with a visualization – you have to really get that audience. Are you trying to convince them of something (I need you to make this decision based on this data), versus a marketer, versus I'm a marketer and I want to present something to a consumer. So I think it really gets into the decisions about how are you presenting, and who are you presenting to, around that visualization.

How do you see your team's visualizations fitting into the larger company strategy? Are there common goals for the visualizations you create?

We have daily or monthly reporting aimed at you're consistently spending money in this area – how's it performing? One of the projects we've been working on is called Datarama- we're basically creating marketing dashboarding tools. When we're pulling in data from the media or wherever else, we have a person on our team whose background is in design and visualization and analytics, so we're work with her and her partners on how do we make those charts things that marketers actually use in their daily or weekly meetings? So they're visualizations that speak to goals and how we're tracking to goals? So we're actually doing a couple of different data points and we're looking at it from a time series perspective. So we have a monthly goal- how are you trending to hit your goal, how does that compare to a prior period? In those type of situations, it's really about giving them a trend, and saying "You're expected to hit 250,000 engagements per month, last month you were at 200,000." These are charts that show daily in the previous period vs daily in the current period so you can see "Where are we at month by month?" because we try to get ahead month-to-month. So they're more operational in nature. One of them went out the managers who were looking at paid media and understanding cost per click, number of impressions, basically kind of doing bubble charts to say how much are we spending, what we're getting for the cost per click, scatter plots with one axis as cost per click, another axis is how much we want to spend, and then the size of the bubble indicates number of impressions. So

we're getting cost per click say in the $1.50 range. The data feeds in, so you can quickly see that certain media types are coming in at $30 per click. Well, that's significantly over our goal. So our agency partner would be looking at that and saying "How can we shift funds away from that area into something that is operating much closer to that $1.25 or $1.50 per click?"

So these charts are meant to be, to a marketing specialist, how can we get this consistent enough that they can quickly look at this and say OK, it's doing what I expect it to do, or if it's not, what can I change? So that's one example of our always-on reporting, but the visualization has to be there so that the Marketing Manager and IMC person should be able to look at dashboard and not ask for help interpreting it. But if they find something and say "I want to dig into this," then I want them to come to analyst team and say "Dig into this. It doesn't look right to me" or "I need a better explanation." Then they come to my analyst team. So that first level of questions I want them to be able to figure out themselves – "Is my business trending the way I want it to, the way I'm spending across these ten tactics- am I hitting my goals? If not, somebody please help me dig in."

The other side would be ad hoc analyses or doing larger campaign analysis – then it's understanding what's working and what's not. Then we do kind of play with different types of visualizations. I would say 75% of the time it's operational, and 25% it's ad hoc.

The goal is based on the audience. My Directors and VPs will probably be more the recipient of the ad hoc than more of the day-to-day. Because they only want to know what's really happening, or what's really working. So you tailor to your audience based on are you helping make day-to-day decisions, or are you helping make executive-level decisions.

When you're preparing visualizations (especially ad hoc) for presentation, do you partner with designers, writers, or anyone with a journalistic skillset?

Even though we're a Fortune 200 company, we don't have the journalistic skillset that you're talking about. Most companies you're not going to find that unless it's a specialty or a niche. But I have encouraged my team as part of our development plan to take courses around storytelling with data. To really understand it's not just about numbers, it's about how you present them. We're trying to build that skillset. You have to meet your audience where they're at. We don't have anyone with the journalistic expertise – I'd love that. I interviewed someone, although I wasn't able to convince her to leave the agency – because we're working with marketing data, I like to have some kind of agency background because it includes more of the storytelling – you have to pitch to clients a lot more so you're not just used to presenting to finance. Nothing against Finance, it's just a different thing. I have not been in the marketing world a ton, so it would drive me crazy when you'd give a great analysis or presentation, but if it doesn't look pretty, they don't actually use it, or they don't put as much weight into the numbers. If our agency could come and make this amazingly branded and pretty dashboard, but the analysis is crap, sometimes the marketers think it's good, and I have to tell them that the analysis was crap. So that's where it really can't be an Excel spreadsheet; it has to be something that's appealing to the eye. I try to hire people with that expertise or if they don't train them to do things like look at the Tableau Viz of the Day and understand what's good about this, how can people interpret it. So that's kind of what I'm looking for.

On the technical side, you also need to know SAS, R, Python, those technical skills, and at the same time know how to tell the story with data. That's why it's hard to find people, and when I do, they're expensive.

When you are trying to train people to tell stories with their data, how do you do that? Where do you send them/what kind of resources are available?

Tableau has some classes, and different places like Coursera and a couple of other online places. Part of it is trial and error in working with our Marketing Communications team – we'll show them the same analyses with two different charts that tell two different stores, and then working with them. The Marketing Manager

is used to the Marketing Communications team and then my team. So when we're doing an analysis, it's less about saying "Here's our presentation" and more about giving them different types of visualization and analysis and seeing what resonates with them better. As you start to know your audience better, you start to say "This bar chart is right for this time and place" – I've got some people on my team who hate pie charts with a passion, and will never ever show a pie chart in a visualization. So part of it's trial and error, but part of it is getting the team to look at those types of blogs, finding the type of data that they're passionate about. Animal Nutrition – it's one of those that's not necessarily where you play with the data just for fun. I'm a sports nut, and Spike on my team is a sports nut too, so we both like any data that covers sports, like MinneAnalytics. They had a sports analytics conference four or five months ago. Go there, get motivation from those types of things, then figure out how you can translate that to your dairy data or your other data. Part of it's that I hire people who are curious. I don't have the time or the bandwidth to train everybody on my team; I want people that will keep pushing themselves to learn new things. Some of this is hiring practices, and you've got to look for people who have that passion for learning things.

You've talked about your immediate goals for this team – do you have your big dreams or stretch goals for your team?

I've been accused of going too fast, so I'm always thinking about the next thing. In terms of maturity level, we're still pretty low to medium. We don't do much customer around or end user analytics yet. One of things we've been talking about is customer journey analytics, and here's what I'd love to do if we had all of the technology – we don't have the technology yet. So let's use the Cattle Marketing Manager as an example. There are maybe five million farmers that need to feed cattle. So that manager divided into five different segments. I'd love to be able to provide is based upon the the actual value of each of those segments, here's the actual attitude and behavior related to Purina that are in each of those segments, and what are the messages that we can do based on that to get those customers on that journey, to get them converted from

trial to service to loyalty. I'd love to be able to provide a dashboard for him that says, "If you've got five million cattle farmers, of those five million, how many do we currently have business with, and of those that we don't currently have business with, where are they at on the journey? Of the five segments, we know that two of those segments may have zero interest in dealing with Purina just because we're a premium manufacturer. Of those five million, don't worry about two million. Of those three million, how are you doing as far as market share?" Having that in front of him, he can say "If my goals is to increase market share or margin per ton, or volume, how much do I have to spend and where, and how can I track conversion rate near real time?"

That's my dream state, so hopefully in two years. We've got some ideas of how to get there. Part of it is data availability – what we have for animal counts and whatever else, but it's possible. It's the maturity of getting there, and the power that gives to the marketing manager, to say "Here are my three levers that I want to pull – do I need to go get more customers, do I need to work more with existing customers, or do I need to increase my profitability? Here's a scenario model of how I can spend across these different segments and see that happen."

It sounds like most of the visualizations you create are internally facing - do you have any way of measuring the effectiveness of your visualizations?

No, it's such a hard thing to measure. It's more anecdotal. So in this one visualization, a report on our chick data campaign – so it's backyard chickens – it was successful. Part of it was the output - it showed 2016 growth, everybody loves it. But the visualizations (done in Tableau using the story feature) we used to create a one page executive briefing, and that executive briefing made it all the way to Chief Operating Officer. So because of that, when there's this hypothesis that we don't do data analytics well, we can show that we do it fine. That carries a lot of weight within the Purina organization for us to get additional resources, for us to say "Hey, we need to do more of this, because we have this money sitting on the table that we're not able to

capture because we either don't have the analyses or we're not able to tell the story to the executives to give them the money more money for Purina." So that was successful, but do I have the metrics? Not really. I think I would spend more time trying to create a metric to show how visualizations are being successful. I look at it more around our ability as an analytics team to influence decision-making. If our analyses are influencing decision-making, then I look at our team as being successful. If we provide analyses and they don't use it, they make the decision based upon something completely different, then we're like "OK, we missed the mark." So I look at it more that way. You can tell based on people's body language when you're presenting if it's resonating or not. If five minutes or ten minutes into the presentation they start checking their phones, you know you didn't hit the mark.

On that note, do you still see a lot of resistance to data, and if so, how do you make it more accessible?

Yes to the resistance. Comfort is growing. It's something like we want to be a data driven-culture, but that works if the data validates their internal assessments of how the market looks. So when it's validating something they're thinking, they love that, but as soon as you come with something that disproves what they've always thought… The visualization is important, but ultimately the numbers speak. I actually just did an analysis – I still like playing with data because I'm a data nerd. I was in a meeting two weeks ago, a full-day strategy planning session on how we work with top customers. One of the guys was just kind of spewing, saying that we should really focus on our top customers, and that's really where our growth's at. I thought he was full of it, so I ran a report, pulled the data in, multitasking through the meeting to do this analysis, and ended up looking at tons and margins, so our two key metrics, and then plotted them to show the locations, what percent are growing, what percent are down. I did this analysis and plotted it out and segmented it by customer type, and I also did the analysis to look at our top fifty customers. We were still talking, and in about an hour or so, I was able to say, "Everybody's saying that horse is down- we've got 3,000 dealers that

are actually up. And some of them are up 25%." Then I start looking at it and pointing out the characteristics of those that are up. They start looking at me, and I say "Here's the data," and I showed it up on the screen, "Here are the dealers. Here's how much they're up by ton" and whatever else. So that kind of quieted them down a little bit, so then I showed my other chart, which shows that 16 of our top 20 dealers are town versus prior years. Some are down up to 40%. That's when you really have to use the data, when the data becomes real, when you're disproving somebody's pre-built mental thought process. So I think when it comes to visualizations, the visualization itself is not going to convince someone, but it really does help – they always say a picture's worth a thousand words – but it really does help put it into perspective. I think when you look at rows and columns, rows and columns don't talk that much. It's really hard to visually represent rows and columns.

One of the best classes I've ever taken was at Target, we had Google come in, and Google did a class around visual analytics. It was only a day-long class, but it was really good about what types of chart work best for what types of analyses. It was great. So going back to your question – we're kind of more data driven, and as data becomes more available, it's sifting through the noise to say "What data is valuable?" You can't just say "Here's the data," because you have to be prepared as an analyst, and a visualization person to say "So what? You did this great analyses, so what? What do I do with it?" If there's no so what or how does this make me money or lose me money, that's where people kind of go "Oh that's neat." It has to be real to them; it has to be really solving a business problem.

Within our IT group, they hired some data scientists fresh out of college. They had zero business context, and they're building these models and trying to find things in the data – they're wasting their time. They need real questions to ask. If you don't have a question you want answered, all you're going to be doing is hunting for a needle in a haystack, and even if you find the needle, you don't even know if you've found the needle. Now, if you sat one of those down with a Marketing Manager and told them the three questions he wanted to ask, and then said "Ok, go play with this data," that's so much more meaningful. Whoever's doing the analysis has to have the business context and I would almost say you have to have weight within the organization, or equity in the organization. So I was asking about your group – for you to go do an analysis

on, say, the hardlines product group, it may be a phenomenal analysis, it may have a lot of insights, but you take it to the merchandising organization, and they're going to look at you like "Yeah, but you're not part of our organization. What gives you the knowledge to do this?"

Do you partner with other data teams across the organization, and how do you interact and share with them?

Yeah, I'm part of the analytic leadership team at Land O'Lakes. We actually just formed this team about nine months ago, and it's people across supply chain, marketing, IT, sales analytics, and even somebody from HR. We're not going to build an analytics Center of Excellence, because we're just not structured that way, but we want to be able to do cross-sharing. We're figuring out how we can collaborate, so how do we talk about our investments in technology and/or people and how do we cross-share to say what's successful, so that across the organization we have one even story? How do we talk about data governance? A lot of the supply chain data is the same data that marketing has, maybe even the sales team has. Across business units, how do we make sure that we have representation? Basically every two weeks for the last nine months, we're doing networking things, so getting people together with other analysts in the organization. Getting cross-sharing going within the organization. We're not a huge organization, not the size of Target, but there are still a lot of silos within the company.

You're clearly well-networked in the field, and as you do a lot of hiring, you must have some insight into what's going on in the fields of analytics or data visualization. Are there big gaps or outstanding questions that you see in the field right now, or things that a lot of people are trying to learn or develop right now?

Yes, I'm not sure about gaps. One of the areas I see within not just our organization but within the industry is that so many people are enamored with big data and fixed analytics and unstructured data- it's such a buzzword that in my mind, the industry is skipping over some of the basics around data quality, emotional intelligence, and how do you reach your intended audience. It's like we've gotten ourselves so involved in churning out all of these amazing visualizations or all of this amazing analysis, but…this kind of goes back to your question about how do you measure data effectiveness, or how much my analysis is used – if you were able to get a metric like that, my guess is probably only 25% of the insights that are generated are actually utilized. Because I think there's so much pressure, so many cool tools and wanting to show that I can do this, not really getting to the heart of what is the business problem that you're trying to solve, and did you actually solve it. Did you actually help make better business decisions. There's so much data available, so many new tools available – text analytics, visual analytics, all that great stuff – it gets to be noise. So that's the biggest gap I see in the industry right now, because everybody's got their own big data platform, everybody's standing up their data link, and we're guilty of it as well – that's what we're doing. Getting the people and the skillsets- the data science skillset is hard to find but getting people who understand business context is gold. Universities are starting to churn out marketing analytics programs, marketing analytics degrees, and whatever else. I think the hard part for the universities is that even they can't keep up with the industry because it's changing so rapidly. So I think that's my biggest gap – how do you find people who can understand the business, do the math, and tell the story in a way that's relevant to the people that you present to? Because me presenting to Marketing is completely different than me presenting to Finance. What I run into is when we talk about marketing ROI, and this is something I'm having to challenge our marketing team on, we did a mixed model and in the first cycle ROI was $1.35. So Ok, explain that to me. What is that as a percentage? That's not how we talk about it. So that's what you're saying, but if I'm taking this to my CEO, he's looking at the supply chain return, my investment in supply chain, my investment in sales, my investment in marketing together. So I can't come up with a number – I have to leave it as a percentage to balance it. So when you say $1.35, is that 35%? So I invest a dollar, I get 35% back? I see that number, but I also see us investing in something with a $.60 ROI. So does that have a minus 40% ROI? Well, if you look at it that way… If that's what you're saying,

you don't understand marketing. You have to understand the COO who's making the decision. If I'm him or her, I'm saying here's $10,000,000, you can get a 15% ROI investing in the supply chain, but you can get a -60% ROI if you invest in marketing, no leader in the world is going to invest in that -60%. So I think that's another area – being able to look at things across, and to truly understand what the data really means.

Interview – Kelly O'Toole

Interviewer: Katie mentioned that you're a designer and that you do annual reports and some financially focused data – can you tell me what you do regarding data visualization?

KO: As far as data goes, I've done design for a lot of annual reports, a lot of infographics, those are kind of the recent buzz word out there – everybody wants an infographic – and there's a broad range of infographics. I use that term kind of like you'd say "data communication" – it's taking those pieces of data and making them more visual, more attractive for the viewer. I come from a whole different side – as a designer, I see everything visually, whereas other writers may only see the words. So I think from my perspective, I always veer people towards "what type of visual do you want?" There's data that we can put in a chart, or there's a storytelling type of infographic where we put in a lot of copy, but we also make it visual so that it tells a story.

I'll give you an example – I did a kickoff for a hospital that recently opened in Richmond, VA, and we did more of a storytelling infographic. So it looked kind of like a page of a book, but it had little bits of information like all of the pieces it took to build the hospital, so we had a picture of the hospital in the corner, and there was a path that led out to a children's park, so it incorporates a lot of different elements, but it tells a story that highlights data points. So who was involved, how much money they needed, what the kids are benefiting from it, and what are the amenities within the hospital. So it's just calling out those different things, so that's more of the storytelling kind.

And then there's the snapshot infographic that I've worked with Katie on, like in the Star Tribune – they're this little one piece, kind of like a nugget of data that you use one visual for. So maybe it's a dinner plate that we make into a graph that says "50% of women eat this for dinner, 50% eat that for dinner." That's just kind of your standard, simplified, snapshot infographic. So there's a wide range of ways to visualize data – comparison, comparing two different things, using a timeline, my mind just goes wild – I'm more of the visual kind of person. I could go on and on, but I'll let you ask more questions.

Interviewer: So you mentioned that everyone wants an infographic- do clients ask you what they can do with their data, or does someone here decide that that should be part of what they're getting?

Good question. Our clients will normally come to us with – it varies by project – a couple different examples. For the annual reports that come in, I take the most important data out of those once I read them, and I highlight which ones I think the audience would really like to know. The biggest thing with the data visualization is that if somebody doesn't have time to read whatever it is, what one piece of information do you want them to see? Their eye will go directly to that visual first, or at least the majority of people gravitate toward those visuals. So what is that one piece of information that you want people to remember? So a lot of times, that can be displayed as a callout, which is just a bunch of words bigger than the rest of the annual report. A lot of times in an annual report, all they care about is the numbers – the revenue, the growth of the company, which in an annual report would be appropriately displayed as a chart, a pie chart, or a graph. In that case, I take the data and interpret it the way I think the audience would appropriately use it.

In a different case, a lot of clients, because they keep seeing other people's infographics, and they see that it's trendy right now, they'll see something else out there and they'll come to us and say "We need an infographic." Well, what are you going to do with that infographic? Why do you need an infographic? Tell us what the problem is and then we can give you an appropriate solution.

One of the clients was like "It's just a pretty way to show facts" or "It's more attractive." So in that case, they wanted to post on their social media sites an infographic. An infographic, in their mind, was this really long beautiful visual with pieces of information in it. But we kind of chopped it up into bite-sized pieces for social media application. So that when you serve these pieces of information it's more attractive and more consumable for the audience to just take one fact at a time, rather than this long list of data points. So, really, we like to hear what the problem is first from our clients, and then offer them a solution based on what kinds of data they want to put out there. So we kind of direct them in most cases.

Interviewer: So when you help clients figure out what their goals are, or when they come to you with a concept of why they need it, are there common themes/common goals/common reasons they come to you looking for visualizations?

KO: A lot of the information gets pretty stale when you read number after number after number, so I think if there is a little bite-sized visual that you can accompany with the number, people will remember it. It's more attractive, it's more consumable. The world that we live in right now is so visual, so rather than reading somebody's post, we don't want to read it anymore – we want to see a visual. Everything's so visual and so consuming that I think it's the most attractive thing that gets all the attention.

So how do we make those facts and those important pieces of information consumable and attractive to the audience? So I think maybe it's the newest way to present information for a lot of our clients, that aren't willing to go towards an advertising campaign or towards bigger ad spending. It's probably more budget-friendly than these other ways of bigger spending.

So you're seeing choosing the infographic option instead of more traditional forms, or as a part of/working with them?

Yeah, it's more budget- friendly to choose like a smaller infographic than to do a larger ad campaign, so I think they kind of see it… and we can kind of cut it down into smaller pieces for them to use in a wide variety of things. Because an infographic or any way you want to display data could be printed, could be displayed on the web, could be used on social media. So I think the variety of uses for it is kind of unlimited, whereas the ad campaign you can really only go one direction, and it's a big spend- you have to spend a lot to get more bang for your buck. So it's one of the more affordable routes for a lot of our clients, so that's probably another reason they're attracted to it.

But with the way that social media is now, you want to bigger, you want to be bolder- it's changing with the times. No one wants to see those numbers just numbers anymore; they want to be more creative. They want to stand out. So it's interesting to see the swing in the industry. Did that answer your question?

Yes, and that makes me wonder- do you find that clients are using these in specific parts of their process? Is it to raise awareness, or increase engagement, or educate customers about their business, or do you see more variety?

It's definitely more topic-specific. I don't see it used for internal communications as much; I see it used for external communication and more really related to specific content or subjects. So, if they're talking about diabetes over here, and then they want to talk about healthcare over here, we do one for each. So it doesn't really cover big broad stories. The example I gave you earlier did, and that's what I would label as a storytelling infographic, but most of these bite-sized visual pieces just cover one focus area, one topic, one ground-breaking piece of data.

A lot of times they use them for press releases, they use them for big events, a lot of print collateral too, and again it's just project-based. I've really created many for a lot of different events and websites. Some people want them interactive, some people want them print-based, so yeah, they're all over the place.

So when you start to think about designing a visualization, what does your process look like? Do you start with the data, or start with a big question and then pull in data, or do you start with an end product in mind?

I'm normally given a chunk of the data and then I start with "How do we want to display it? Is it informational, is it storytelling, or a bite-sized piece of information?" So I kind of start there. The actual visuals you would receive for each of those areas are different, and they have different processes. If it's a story, then we want to tell a story and we'll highlight different elements within that. If it's informational, there'll be a lot of copy, a lot of points to highlight. If we want to specifically visual, then we don't really show a lot of numbers – we show numbers visually. So if there are a hundred people, we put a hundred little bodies on there. So I start there- evaluate the content and the data, and then decide which direction to go with the visuals. Then from there, just taking the content that will be most attractive and most consuming to the audience, and really highlighting those. Definitely creating a sense of hierarchy with the data, making sure the most important information is most prominent on the page, or within the chart or whatever piece of content or media it is.

So it's really just evaluating the data and making sure that the most important pieces are front and center.

Can you tell me more about your career? What does coming from a design background into data look like? Do you have additional data education, or are you following client demands?

I went to the University of Kansas for college, and I got my graphic design degree there, and I just love the whole design world, and creating infographics is just one piece of being a designer, and kind of taking a problem and providing a solution for it. So I went through classes at school that kind of highlighted data visualization. I feel like it's more popular now and more talked about now, but it's always what we as designers have done. It's just what is that data? It can be a number, it can be a group of people- you need to take that and provide a visual solution for that problem. So I never got specific data training or went to any classes for it- it was kind of taught throughout my curriculum.

Do you work with statisticians or people more on the technical side?

I do not. A couple of our social media guru guys could probably help you more with the data – more of the content side of the data and pulling numbers from particular visuals, or the visual statistic side. We test a lot of it… I don't know if this applies as data. A lot of the visuals that we create we'll test them to see where the viewer's eye goes first. And that produces a lot of data about whether your eye goes to the headline or the image… there's a lot of testing like that that goes on in house.

We work with a lot of people to provide a lot of data outputs, but I don't, specifically. It's two different minds, right? Even working with my strategy partner, she'll hand me a bunch of copy, and it doesn't mean anything to me. I think "what do you want the viewer to see?" So it's kind of bringing the two minds together – what kind of visual would that be? There are five different variables here, and we need to make that into one cohesive fact. So what is that fact? I think sometimes on the other end, it's hard if you're not visual to be like "here, just create a visual." But we kind of have to mold the content and the copy to fit into a visual way to consume it. So it's left-brain/right-brain; people consume it differently. So working together to mold the copy to fit a visual is very important in the process. Some people can do it really well, and some

people have a really hard time writing content that can be visually displayed. So it kind of lends itself to people who write ad copy- that kind of lends itself to be a bit more visual, so we can kind of craft that copy to be displayed by that. But a lot of the more PR side people write press releases- they have a hard time being able visualize or providing the right content to be visualized. So a lot of times I've had to read the press releases to be like "Here is the visual. This needs to be the visual because this is the most important takeaway." So it's different minds working together and figuring out how to boil that down. So a lot of times, if we do a storytelling infographic, where we are telling a story visually, we'll have to take the copy from the account person and bring it in to the creative side and have an ad copywriter rewrite it for visuals, for whatever media we want to push out there. Because a lot of times it will just be so stale, and we really want to boil it down to just the pieces of information that are important, so we don't want a sentence, we just want a statement, and no paragraphs.

How does what you do fit into the industry as a whole? Do you think your role and service that you provide is a common one?

I guess my answer is that the definition of data visualization is so broad – you won't find it on other agencies' websites. They won't say "we visualize data" or "we're a data visualization company," because it just doesn't exist in this industry. That's what we do- everything we do is data visualization. I think if somebody put that on their website, it would be like saying "We write press releases." Everything we do is taking data and communicating it to different audiences in the most visual and attractive way we can. So I think everybody does it, it's just a question of what is the data that you want to visualize? Do you want to be specific to just numbers, or is it an emotional benefit, or what is that data, or is it just a key insight? Is that your data? Because that can drive a whole ad campaign. So I think there are a lot different ways to solve for that, not just infographics. I know Katie probably said "She does infographics, so that's perfect!" but really, that's all I do. Everything I do I create visuals for. So it's a matter of what specific data are we talking about.

It's just one piece of what I do, but the term "data visualization" is everywhere now. Every visual you see contains data, it's just a matter of what is the data, and what is the visualization trying to tell you. I think that's what is important to remember with all of this social media coming at you, every image contains the data, so what is it saying to you? So nowadays, you're like "Why that image, and what is it saying?" Because there's so much data coming at you.

And to get more analytical, you can dive into the numbers of a visual. You can test response to a visual. So it's a wild topic, because there's so much information, and it's so broad.

Interview – Lee Thomas

Interviewer: Would you tell me a little about your background and how you've worked with data, design, and communications, either separately or in shared spaces?

LT: I have been a professional communicator for almost 20 years. I started out from an editing perspective and then found the technical communication program at the U. I did that program way back when. Similar to you, I was working full time, and managed to plug my way through the program. But that was an interesting time – this was right around '99/2000, and I first got into Information Architecture in the .com boom, so nothing really data-oriented back then, but more just structural and content-oriented things.

From that point for the next 12 years I worked at various branding, marketing, and digital media agencies around town, and that's where, if you looked at my LinkedIn page, I had a lot of different titles and roles at that time. But almost everything I did was fueled by that educational background in technical communication. And I kept in contact in that department, and one of my interest areas was visual communication. So I did my capstone project within that area, and long story short, I ended up here at the U, working in this department for a research center that no longer exists, but this department, Information and

Decision Sciences, had just started a new Master's program in Business Analytics and Data Science. So by virtue of being in the right place at the right time, I got kind of attached to that program, and now that is a big part of my role- working with the students in that program. So it's a one-year intensive program in Business Analytics. So it's very data-heavy; the students learn all types of analysis techniques, but the foundation of it is from a business perspective, so it's different from a computer science degree, for example. So a big part of what they have to do is communicate what the work means to other stakeholders in the business. And that's where we see a huge amount of demand from employers. Yes, they want the people with the analytics skills and the technical skills, but time and again, they ask for people who can communicate about the work. So my attachment to it has grown over the years in that I try to bring some of the curriculum from the Technical Communication program over here to the West Bank to this school to help those students who are very much coming out of STEM backgrounds to help them develop skills in communication of their technical work.

Parallel to that, the Department of Writing Studies asked me to teach the Information Design course, and this was about a year and half ago, and I was excited about that because that was my favorite part of the field, and something I've been interested in all along, and during that time when I worked at those agencies, I worked at those that were very design focused, so I got to work with a lot of people who were very design-focused, even though I'm not trained as a designer. But there's sort of this fuzzy middle ground where information design and graphic design and technical design all kind of collide, and so I've found myself in that intersection of places. So that's what I do now- the stuff here with the Business Analytics students, and also teaching that course online in the Technical Communication group, and working on bringing more of that, especially with the visualization of data, and design in general, more of those techniques for students here.

Has finding yourself at the fuzzy intersection of fields opened more opportunities for you or made you more marketable, or do you just have a harder time describing it?

It's often challenging to describe – I think of myself as a professional communicator who specializes in strategy and information design. So that's usually how I try to bucket things. But there is a lot of overlap – there's a lot of things that I have done that I wouldn't say I'm an expert in, and a lot of things that I specifically tell people I don't do. I'm not trained as a graphic designer. I do a lot of design-type activities, but I really see myself coming out of the technical communication field and the information design field, so the emphasis being more on the marriage of content and visual expression of that content and information. What's interesting is that technical communication is a field with a lot of skills and knowledge that are applicable to many many other fields, but I think it's not as well known or as well understood as other fields.

Tell me more about the marriage of content and design that you're interested in. Is there a theoretical basis that you use to introduce people, or do you use more real world examples?

One of the things that I've been doing recently is just trying to demonstrate to students – I've found that visual communication skills are severely underrepresented in the corporate world, and even among communicators. Unless you're coming out of a graphic design background, many professional communicators aren't particularly well-trained in visual communication ideas or skills. Even the course that I teach in information design – people coming from either Technical Communication or the Strategic Communication program – I get a lot of people who are nervous about it because they don't have graphic design skills. I understand that, but what I think is interesting is that there's so much power in developing those skills, so even a little bit of knowledge in those areas tends to open people's eyes to the possibilities.

I'll get back to your question, I promise, but I have a story that might interest you. When I was in the Technical Communication Master's program, somehow I found this book, *The NonDesigner's Design Book*, which is not an academic text by any means, it's more of a professional guide, but she has some basic

principles of design in here, including contrast and repetition and proximity and alignment, and this was one of the most useful books I've ever read in terms of understanding and seeing, because she uses lots of visual examples, how content and design can come together. So going through this book and learning some of these techniques was very powerful for me, so now I teach this book in my course and try to teach some of these basic principles.

In terms of that marriage, one thing I tell students now is that there's this whole channel that visual communication works on with our brains that is different from the verbal channel. So a lot of these students are doing PowerPoint presentations to business meetings, and you get lots and lots of slides with lots and lots of text and so one of the things I try to help them with is understanding that people in an audience, when they're being shown text and being talked to, those two sources compete for bandwidth in the brain, but visuals work on a different level. If you can use visuals to help create your message or to help reinforce parts of your message, you just have that much more access to the brain, which I think is super interesting. The other thing that I do is show them examples of times when visual and verbal content are in conflict, so I have examples where a student has used one of the default SmartArt functions in PowerPoint or Word to do a chart of some type. If you look at charts, visuals carry information separate from text content. I do this exercise where I show students different graphs that are empty of content, and I ask them to respond by saying things like "Input : Output" or "Circular Process." I can show you if you want.

Interviewee shows PowerPoint default SmartArt matching following descriptions. So if you look at this, there's no content in it, but you can see that it's step-by-step process – Or input-output, or hierarchy, or cyclical process – so when I show this to classes, they all can immediately answer this. And then I go into something like this, for example – what is this one? *Interviewee shows template for step-by-step process with foreign type*. People say, "Oh, it's a step-by-step process" based entirely on its design, visually. Well, this came directly out of a presentation by a student team, and the content was not at all a step-by-step process. They were all discreet items. So their visual presentation and their semantic content were in conflict with one another. So they're showing this to an audience and the audience is expending cognitive effort. Yes, they figure it out, yes, sometimes people

argue with me about "Is it really that big of a deal?" My argument to that is that if you're trying to influence that audience in some way, why would you put up roadblocks?

So I don't know that that really answers your question in terms of theoretical basis… I use a lot of Edward Tufte, who is sort of a godfather of all this stuff, I use a lot of Charles Kostlenick, Karen Schriver's work is really key to this, and there are many others.

And then there are things like we talk a lot about Gesthalt principles and pre-attentive attributes, those types of things.

How do you see data visualization as a part of the process? Where does it fit as part of a communications strategy?

I see a few things happening. One is data visualization for the purpose of understanding the data and exploring it, and that seems to be what the Business Analytics program focuses on in their curriculum. That's probably familiar to you given your role. That's not necessarily something that I'm particularly familiar with, but what I see there is a process of using visual means to make some sense of the data, which is essentially why we graph stuff at all.

Then I see the use of visuals to communicate data, and that's the part that I'm trying to communicate to these students here. Just putting the graphs up on the PowerPoint slide, just copying and pasting them out of Tableau or whatever you're using, doesn't necessarily convey the message to the audience. So I help them figure out a good way to approach what their communication purpose is and what they're trying to convey to audience, and to then make visual choices that help create that effect rather than just copying and pasting. So what I see a lot of, especially with students who are new to this idea, and as you can imagine, students coming to a Business Analytics program are especially not versed in visual communication, so I see a lot of things like the wrong kind of graph, or just copying and pasting out of whatever graphics program they used, which

doesn't necessarily focus attention on or highlight the piece of data or the data story that is relevant to the specific data question.

So that's where things like Stephen Few, and do you know this *Storytelling with Data* by Knaflic? I think she even makes the distinction between exploratory visualization and explanatory visualization. So I'm trying to help these students learn that improving the way they present explanatory visualizations will help them achieve their goals.

When you're helping students think through their purpose for these visualizations, do you see common goals that they have or common reasons that they're drawn to using visualizations?

I would say more often they resist them, and I think a lot of that is either feeling uncomfortable with the software, or not knowing how to do it effectively, or just having more mathematically inclined brains – they're very comfortable with numbers and tables and formulas and things – but they do see the value in being able to do it well. And even just small things, things like taking a graph and showing them how it could be better based on whatever their communication goal is. They're very receptive to that.

How do you see data visualization and the movement toward charts and graphs interacting with more traditional communications forms?

I don't think it's necessarily so much about the visual aspect as it is about the data aspect. I think it's more of a function or a symptom of the big data revolution – we have all of this data that we didn't have before, and we have the computing power to deal with it. We have the software to visualize with it.

So in other ways, I think it's not necessarily any more different. You look at Tufte's examples that go back centuries. So the visual aspect of that is not that different from what's being done right now with data. There's probably also an element of having the technological tools to be able to do this. That's another part of Tufte's argument – it used to be that in order to use visuals in a scientific argument, you had to have an illustrator – an actual human being – create the graphs. There wasn't a desktop computer on everybody's desk that could generate graphs. Similar to word processors or blogs or any other of the technologies we now have, anybody can have access to those tools. That takes the technological barrier away but it also means you get a lot of bad output. Everyone has access to PowerPoint, but few people actually know a lot about visualization to be able to use it beyond the default settings.

Do you do any work with interactive visualizations or media?

I haven't done interactive work with data in particular except a big part of what I do here at the Carlson School - Business Analytics students do an experiential learning project. It's a fourteen week/semester-long project where they work for a client company working with real data to solve some kind of a business problem. So this spring semester, we had 16 students doing 16 projects for client companies. Some of them end up delivering things like dashboards, and those dashboards will be interactive. I find myself coaching and advising them on the design of the dashboard and whether it's actually communicating what you want to communicate to your end user. Many of the same principles come into play, in terms of how are you labeling these things, why are you labeling these things, what colors are you using and why, what graph types are you using and why- you have the same set of choices and same set of principles, it's just a different medium. And I'm routinely surprised to see but also happy to help them, because they make a lot of mistakes in that area. They'll use whatever Tableau or PowerBI's default graph setting is for something, and it doesn't make sense given what they're trying to do. You look at it from their end user's perspective and you can see that hey,

that's really confusing. What if we just did some visual changes to this to make it readily apparent to whoever's looking at it what they're looking at and why? As opposed to making them decipher it.

You mentioned the end user's perspective – do you have any interaction with the end user? I know there are lots of studies on perception and what works for the end user – do you get to see any of that in person, or do you mostly coach people through the creation process?

I have, but in the last few years, no. I'm more on the up-front data creation side of it. I keep the user perspective in mind as much as possible, but I haven't done as much through usability research. So there's always that possibility that nothing I've made works….

Getting back to that fuzzy space that you're in at the intersection of multiple fields- how common do you think that is? Do you see other people in similar positions in the field, or do you have a perspective on what others are teaching, as far as bring communications and design and sometimes data together?

From a personal perspective, I would say that it has become normal for me to find myself in that in-between space. I don't know why, but it seems to be where I end up, in between fields or positions trying to translate between them.

From the larger scene, in terms of what I hear from employers coming to the Carlson school to recruit data analysts, is a big appetite and demand for people who can play that role, who can be the translators. So I don't know if it's necessarily a rare skillset – I think it is relatively rare, as opposed to people who are more traditionally in one field or the other – but there is certainly increasing demand for it.

What do you see in the field as far as using data visualization as a design component in a savvy way? Do you see people or companies who are doing that well, or do you see some consistent gaps?

Sure, there are a lot of companies doing it well. You can find a lot of examples in both categories – good or bad. I always have to pull back a little bit when your questions are on data visualization- I am more interested in visual communication and data as a part of that, so I come at it in a slightly different way, maybe, than the other people you're talking to. Things that I see routinely are business professionals, analytics students, analytics professors, people who are sort of more mathematically inclined – not just them, this happens all the time – but there's this not having the visual communications skills to tap into that way of communicating. So that applies to yes, their data and whatever graphs they're using, but it also applies to their slides and their documents and their reports, and that kind of thing. Now, when you get to the level of looking at a company's professional publications that have been done by people who are designers or professional communicators or others, then you see lots of good examples.

How do you think about data as a part of the bigger picture? Is it a tool, and example, a form…

I think of data as content. Again I would go back to the earlier questions of yes, there's data for the purpose of looking for information within the data and trying to understand what's in the data, looking for patterns and that kind of information, which is not what I do, so I can't answer that part of the question.

On the other side, using data and visualizations of data to communicate some idea or point or message, that to me is content. It's a different kind of content, but the data is content, just like words or images would be content.

Obviously there are frequent technical changes in this area – what kinds of changes do you see coming in the future and how much do you anticipate that they'll affect the kind of work that you do?

The technology's always changing, the software's always changing; there's all kinds of cutting-edge stuff like giant, interactive smartboards, virtual reality, and all those kinds of things… I would say with any of that, the technology keeps getting more sophisticated, keeps getting better – the question I always wonder about is with that technology, there inevitably comes defaults and templates and built-in settings and all those kinds of things. So somebody is making choices about those. So the user of the software or the technology may or may not have some control over those choices. So just like we've seen with word processors or PowerPoint or any of those kinds of technologies, there are advantages to defaults and templates, but there are also a lot of pitfalls. They are inevitably not suited to all situations, and if the user doesn't understand how to use it, and just depends on the default settings or templates, they run into problems and mistakes. So I think the same pattern plays out no matter what the technology is. I'm more interested in the understanding of the theory, the understanding of the perception, and helping students to make informed choices or at least clear choices.

We've talked a fair amount about the relationship between data visualization and visual communication. Can you tell me a little about how you see the relationship between information design and communications strategy?

I'm always starting in the place of communication. What's the rhetorical situation, and what's the speaker's purpose, what's the audience, what are the things you need to communicate. Technical communication is built on rhetoric, that discipline – that's really what I've based my career on, and what I base my teaching on.

Always, there is a rhetorical situation, so there aren't black and white answers. I'm fond of saying to the students in the Business Analytics program that there are lots of right answers to these questions. Some of them have a tendency to want a formula, and it's human communication, so it's not as cut and dry as a math formula or computer algorithms.

And then, the visual is a means of persuasion. So Aristotle's definition of rhetoric is finding every available means of persuasion in a given situation, and so in that there are logical arguments, and there are arguments based in pathos and ethos, and I would also say that that's what visual communication is all about – it's one means of making an argument.

Thanks – I know a lot of this seems very obvious to you, but the benefit of an exercise where I'm speaking to people approaching this is in different ways is hearing how their perspectives differ. You're helping provide a well-rounded perspective on what's really happening in the industry.

You know, another story comes to mind that might interest you – I was teaching a class yesterday to the Business Analytics students, and we talk about this story about a doctor named Semmelweis – have you heard this story? He was a doctor in 18th century Vienna who noticed that at the hospital where he worked, where they had two different wards with mothers who delivered babies, that one of the wards had a higher mortality rate than the other. He figured out that it was due to the fact that in one of the wards, midwives delivered the babies, and in the other ward, doctors delivered the babies. The doctors, between delivering babies, would do autopsies, and then not wash their hands between doing autopsies and handling patients, so the infection rate was higher. So he did this experiment where he washed his hands with a chlorine solution and saw the mortality rates go down.

What's interesting about it, and why it's an instructive case, is that he had the data, but he failed to convince his colleagues and other physicians at the hospital. It doesn't really get to the visualization part of

your questions, but the reason why it came to mind is that numbers alone don't always convince people. Even really compelling numbers; even really great data. So there's theory and research out there that looks at what is actually persuasive to people? What actually convinces them? So what has been shown is that numbers and data alone is often not what convinces people or drives decisions, but arguments that also include things like story elements and emotional elements and sensory elements usually perform better than those based on numbers alone. I think certainly we can see that in visual examples, but I find it interesting that you have these instances or these stories like this doctor who had the right answer, and you have these students who come into this program excited to solve the math problem or find the answer, but that doesn't mean you've really persuaded anyone or convinced anyone to change their behavior or created an impact. So, not directly related to the visual side, but more related to the data itself. And coming at it from the side of more of a technical communication or a rhetorical perspective of persuasion, that's really interesting to me.

That's interesting – I was talking to someone at Land O'Lakes who is more on the technical side but said something really similar – he sees creating a persuasive argument as a primary function of his team.

It's not just about the people who can do the analytics, but who can communicate. And by communicate, I don't mean just convey information, but actually help people understand what it means, and help people understand what to do about it, so that change happens. You know it's sort of that extra – getting the answer to the problem doesn't mean that the problem is solved, or that anything changes in real life or real business. I think that is probably true of a lot of things, not just data analytics, but persuasive communication is a valuable tool for all of us.